



Taxonomic Review of Cicadidae (Hemiptera, Auchenorrhyncha) from Taiwan, Part 1. Platyleurini, Tibicenini, Polyneurini, and Dundubiini (Dundubiina)

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Abstract The species of Cicadidae (Hemiptera, Auchenorrhyncha) from Taiwan are taxonomically reviewed. In this paper, 20 species belonging to nine genera in cicadine tribes, Platyleurini, Tibicenini, Polyneurini, and Dundubiini (subtribe Dundubiina) are included. *Cosmopsaltria montana* Kato, 1927 is synonymized with *Macrosemia kareisana* (Matsumura, 1907). Information on the biology and the male chirping of most species including two oscillograms are provided. Information on the distribution of all known species is given.

Key words synonym, distribution, fauna

INTRODUCTION

Taiwan is one of the fascinating islands to biologists for its rich biodiversity. It is probably due to the fact that Taiwan is located in the subtropical region latitudinally and has a broad range of altitude from the sea level up to about 4,000 m. These factors might have diversified the plant and animal species living in Taiwan and have made this island one of the areas having very rich flora and fauna.

The first report on cicadas in Taiwan was made by a European entomologist, W.L. Distant, in 1904 with the description of a new species, *Tosena seebohmi* (currently in the genus *Formotosena*). After his works (Distant, 1904a, b, 1906), the rich fauna of the Taiwanese cicadas attracted Japanese researchers. S. Matsumura described many new species from Taiwan in the years between 1907 and 1927. M. Kato wrote a number of papers on the cicadas of Taiwan between 1925 and 1956, based largely on his own observations and collections made during his stay in Taiwan from April of 1923 to May of 1928. As he had stayed long in Taiwan, he could leave us much biological information of the Taiwanese cicadas. T. Esaki described two new species in 1933 and 1935.

In the meantime, a German scientist, F. Schumacher, published a short paper on the Taiwanese cicadas in 1915. Another German scientist, E. Schmidt, described a new species in 1918 and reviewed the Chinese cicadas including 39 Taiwanese species in 1932.

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After Kato's last report in 1956, papers on some Taiwanese cicadid species were published only intermittently by Hayashi (1976a, b, 1977, 1979, 1987b) and Okada (1999, 2000, 2002). However, the fauna of the Taiwanese cicadas was far from completion as no local specialists have worked.

This series of papers aims to cover and provide the available information on the taxonomy, biology, and distribution of the cicadid species in Taiwan. In this study, however, only adult specimens are examined. A total of 55 species belonging to 21 genera are listed as the Taiwanese cicadas, including a new genus and four new species throughout the present study. Five species, previously known, are synonymized. Three species are newly considered as erroneous records from Taiwan due to mislabeling or misidentification.

As the first part of this study, this paper includes 20 species under nine genera with four cicadine tribes, *Platyleurini*, *Tibicenini*, *Polyneurini*, and *Dundubiini* (subtribe *Dundubiina*).

The second part will include 17 species under six genera in a cicadine tribe, *Dundubiini* (a part of the subtribe *Cicadina*). The third part will include 18 species under six genera in cicadine tribes, *Dundubiini* (another part of the subtribe *Cicadina*) and *Moganiini*, and a tibicinine tribe, *Huechysini*.

MATERIALS AND METHODS

Collection and examination of specimens

This study is based mainly on the specimens collected and kept by the first author (YJL) in Taiwan in September of 1997, June of 1999, June of 2000, July of 2001, May of 2002, and August of 2002. The second author also visited Taiwan twice in June–July of 1973 and June of 2002. The specimens collected by him and offered by some Japanese entomologists were also examined for this study, which are preserved in Saitama University, Saitama, Japan (SUU).

A part of the specimens examined are from the collections in the following institutions: National Museum of Natural Science, Taichung, Taiwan (NMNS); National Taiwan Museum, Taipei, Taiwan (NTM); Taiwan Forestry Research Institute, Taipei, Taiwan (TFRI); Taiwan Agricultural Research Institute, Wufeng, Taiwan (TARI); Center for Insect Systematics, Kangwon National University, Chuncheon, Korea (CIS); Hokkaido University, Sapporo, Japan (HUS); and Kyushu University, Fukuoka, Japan (KUF).

As no type specimens designated by Kato are available for the scientific study, the identifications of the species described by Kato were based on all available information found from his works including original descriptions of their external morphology, photographs, biological information, chirping sounds, etc.

Terminology

Wings (Fig. 1). There are a few different opinions regarding the terminology of wing veins and cells. The determination of wing veins in this study is exclusively in accordance with Comstock and Needham (1898), Evans (1941), and Hayashi (1987a), because of probable importance of the close relation between the wing venation and tracheation. Wing cells are determined by the surrounding veins, and primarily by using the name of its anterior vein.

Male genitalia (Fig. 2). In the Cicadomorpha of Hemiptera-Auchenorrhyncha, the Cicadidae are most peculiar in the morphology of the male genitalia. The 9th abdominal segment forms a genital capsule, 'pygofer' by the fusion of the tergum and sternum, lacking a pair of styles (harpagones). In some cases, there are a pair of ventral lobes derived from the 9th sternum on the ventral side of pygofer. The 10th segment is called as 'uncus', modified by

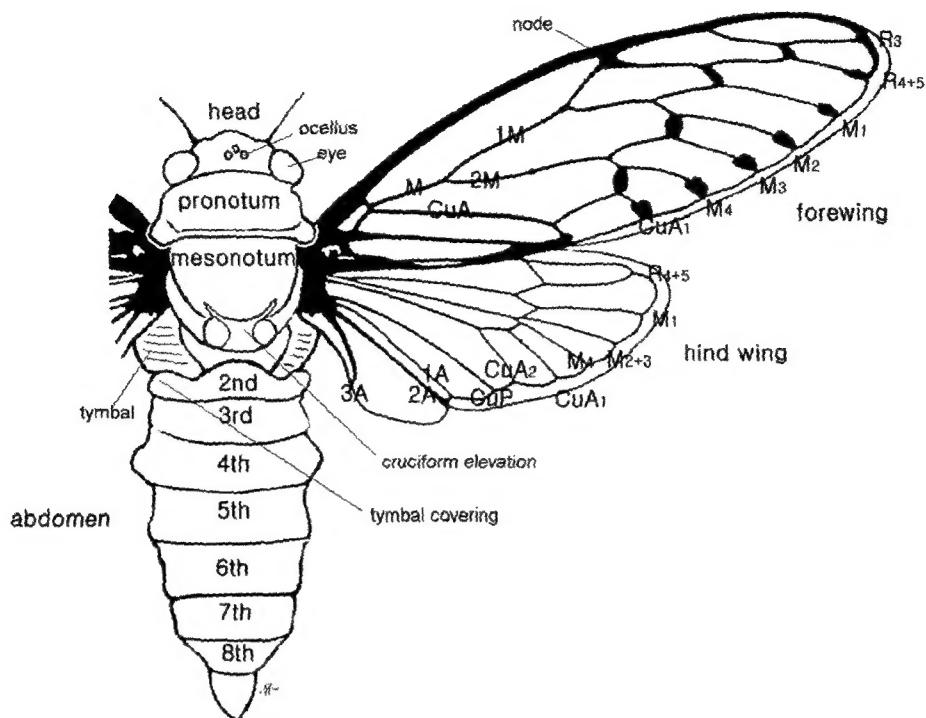


Fig. 1. Dorsal view of the male body and the wings (*Euterpnosia varicolor*).

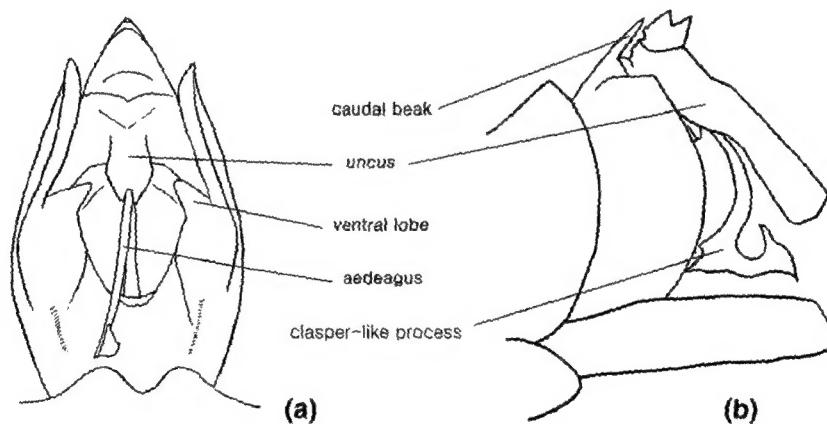


Fig. 2. Male pygofers in ventral (a) and lateral (b) views.

a pair of hook-like processes, 'uncus lobes', which are sometimes fused to a single lobe. In some genera, there are a pair of clasper-like processes under the uncus. Adeagus means theca which is formed by the tubular elongation of connective (Hayashi, 1987a).

Names of the counties and localities of Taiwan

In the text of this paper, the names of the counties of Taiwan are abbreviated as follows (Fig. 3):

- TP : Taipei County (臺北縣)
- TY : Taoyuan County (桃園縣)
- HC : Hsinchu County (新竹縣)
- IL : Ilan County (宜蘭縣)
- ML : Miaoli County (苗栗縣)
- TC : Taichung County (臺中縣)
- HL : Hualien County (花蓮縣)
- NT : Nantou County (南投縣)
- CH : Changhua County (彰化縣)
- YL : Yunlin County (雲林縣)
- PH : Penghu County (澎湖縣)
- CI : Chiai County (嘉義縣)
- KH : Kaohsiung County (高雄縣)
- TN : Tainan County (臺南縣)
- TT : Taitung County (臺東縣)
- PT : Pingtung County (屏東縣)
- UN : Unidentified localities

The locality names under the titles of 'Locality' or 'Localities' for each species in this study follow the way used most widely from the maps and road signposts in Taiwan.

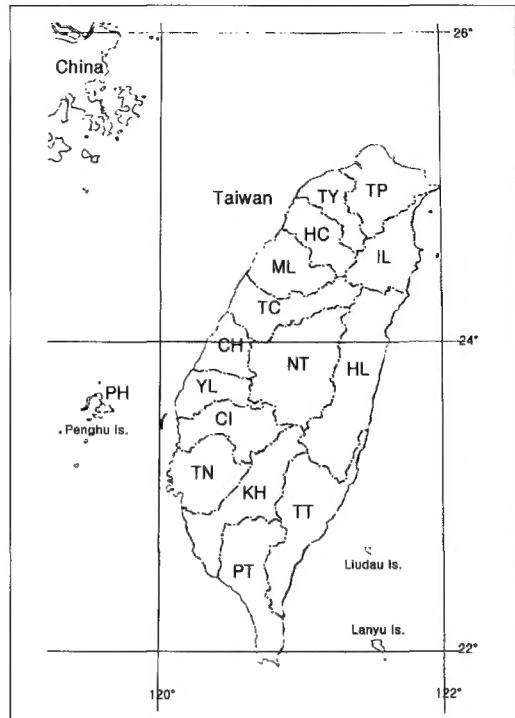


Fig. 3. Map of Taiwan with abbreviations of counties as used in the text.

SYSTEMATICS

Family Cicadidae

Subfamily Cicadinae

Key to the tribes of Cicadinae of Taiwan

1. Male operculum not enlarged at subapical portion toward body center; caudal margin of female 7th abdominal sternum never or not so curved anteriorly 2
- Male operculum enlarged at subapical portion toward body center; caudal margin of female 7th abdominal sternum curved anteriorly in middle, approaching or nearly reaching 6th sternum Moganniini
2. Lateral margin of pronotum triangularly produced laterally, often dentate; forewing with blackish cloudy markings; hind wing mostly opaque excluding marginal area Platypleurini
 - Lateral margin of pronotum not triangularly produced laterally; forewing and hind wing hyaline or partly or entirely opaque without cloudy markings 3
3. Head including eyes about as wide as abdomen including tymbal coverings; tymbal completely concealed with tymbal covering Tibicenini
- Head including eyes narrower than abdomen including tymbal coverings; tymbal incompletely covered by tymbal covering 4

4. Male abdomen opaque ventrally; wings entirely opaque *Polyneurini*
 - Male abdomen more or less translucent ventrally; wings hyaline although sometimes infuscated and/or tinged with a certain color *Dundubiini*

Tribe Platyleurini

Key to the genera of Platyleurini

1. Body flat, with its cross-section oval, and covered with relatively short hairs; tymbal covering not globose laterally; costal membrane of forewing moderate, outer margin outwardly curved *Platyleura*
 - Body, especially thorax, convex dorsally, forming its cross-section nearly round, and covered with relatively long hairs; tymbal covering globose laterally; costal membrane of forewing much expanded, outer margin straight *Suisha*

Genus *Platyleura* Amyot and Audinet-Serville, 1843

Platyleura Amyot and A.-Serville, 1843: 465. Type species: *Cicada stridula* Westwood, 1845 (South Africa).

Diagnosis. Small-sized; body somewhat flat, short, broad, and covered with relatively short hairs; head wide, truncated anteriorly, including eyes about as wide as base of mesonotum; frontoclypeus hardly prominent anteriorly; lateral margin of pronotum laminately produced, acutely angulated near center; tymbal mostly concealed with tymbal covering dorsally as well as laterally; abdomen obconical, shorter than distance from head to cruciform elevation; ovipositor hardly extending beyond 9th segment (pygofer); male operculum short, transverse, roundish, overlapping each other, and extending hardly beyond 2nd abdominal sternum; fore femur with three spines on under surface but not so distinct; forewing with eight apical cells, 6th apical cell about as long as twice of 5th apical cell, outer margin outwardly curved, furnished with fuscous and ochreous cloudy markings; hind wing opaque except for outer marginal area.

Key to the species of *Platyleura*

1. Hind wing black or much infuscated with outer marginal area hyaline 2
 - Hind wing yellowish with dark ochreous markings along marginal veins and on central part *hilpa*
 2. Head and pronotum greenish olivaceous (in fresh specimens); anterior margin of head more or less flat; margin of lateral dilated part of pronotum forming a relatively acute triangular angle; forewing in apical 1/2, hyaline part distinctly less than fuscous part *kaempferi*
 - Head and pronotum jade green (in fresh specimens); anterior margin of head more or less roundish; margin of lateral dilated part of pronotum forming a relatively obtuse angle or a roundish line at an angle of more than 120°; forewing in apical 1/2, hyaline part broader than fuscous part *takasagona*

Platyleura kaempferi (Fabricius, 1794)

(Fig. 4)

Tettigonia kaempferi Fabricius, 1794: 23, 25 [TL: Japan].

Platyleura repanda: Matsumura, 1907: 94 (nec Linnaeus, 1758).

Platyleura kaempferi: Matsumura, 1907: 94; Schumacher, 1915: 108; Matsumura, 1917: 186; Kato, 1925a: 2; Kato, 1927a: 20; Kato, 1930: 51, 61; Kato, 1931: 220; Kato, 1932: 222; Schmidt, 1932: 117; Kato,

1933a, pl. 1; Chen, 1933: 358; Hirayama, 1933, pl. 94; Kato, 1934: 145; Wu, 1935: 2; Kato, 1938a: 2; Kato, 1956: 109, 125, 184; Hayashi, 1979: 259; Duffels and van der Laan, 1985: 21; Chou *et al.*, 1997: 168.

Platypleura kaempferi var. *formosana* Matsumura, 1917: 187 (*kaempferi* var. *formosan* [sic]) [TL: Koshun, Keibi, and Hoppo, Formosa]; Kato, 1925a: 2; Kato, 1927a: 20; Schmidt, 1932: 117.

Platypleura kaempferi dentivitta Kato, 1925c: 92 [TL: Chikushiko, Shinchiku, Kiirun, and Ssozan, Formosa]; Kato, 1927a: 20.

Diagnosis. Body covered with short grayish hairs. Head, pronotum, and mesonotum greenish olivaceous; head with following black markings: a transverse fascia between eyes forming a spot at area of ocelli, continued on inner margins of eyes, two small discal spots, and a fasciate spot at anterior lateral angles of vertex; pronotum with a central hourglass-shaped fascia, diagonal grooves black; mesonotum with four obconical spots on anterior margin, a lanceolate discal spot, much widened posteriorly, and a spot in front of each anterior angle of basal cruciform elevation, black; abdomen black, posterior segmental margins narrowly dull olivaceous; male tymbal coverings entirely or partly fuscous. Forewing with fuscous and ochreous broad cloudy markings at basal 1/2, on apical and cubital areas and one near apex, costal membrane with two blackish spots, remainder of forewings hyaline; hind wing black or much infuscated except for outer marginal areas hyaline. Anterior margin of head more or less flat; margin of lateral dilated part of pronotum forming a relatively acute triangular angle.

Male genitalia. See the description and figures (for the specimens from the Japan Proper) by Hayashi (1974).

Measurements. Body length: ♀ approximately 23 mm. Total length (distance from the tip of the head to the apical end of the forewings folded): ♀ approximately 37 mm.

Material examined. [TP] 1♀, Tanshui (= Danshuei 淡水), 16 VII 1973, M Hayashi (SUU); 1♀, Mt. Yangmingshan (陽明山), 14 VII 2001, YJ Lee (YJL); 4♂, 1♀, same locality, 23 VI 1973, M Hayashi (SUU); 2♂, 1♀, same data except for 17 VII 1973 (SUU); [IL] 1♀, Fushan (福山), 17 VI 1992, YB Fan (TFRI); 1♂, same locality, 27 VI 1995, SS Lu (TFRI).

Biology. This species seems to be distributed only in northern Taiwan. The records from southern Taiwan are possibly erroneous ones due to misidentifications. Adults appear from April to August. See also the information for the Taiwanese population given by Kato (1956).

Male chirping. A call begins with a sharp, metallic, and continuous “ssee—” sound, which lasts for a few seconds and then suddenly changes, without interruption, to another “ssee—” sound at a much higher pitch. This tone at the higher pitch continues for longer than 10 sec., and then the pitch lowers for another few seconds. The lowered sound again jumps to a higher tone, almost at the same level as the previous higher tone. The cycle is repeated for up to several tens of minutes under favorable conditions. See also a note given by Kato (1956).

Localities. [TP] Danshuei (new), Mt. Mientianshan (面天山) (Hayashi, 1979), Chutzuhu Lake (竹子湖) (Kato, 1925c), Mt. Yangmingshan (Kato, 1925c; Hayashi, 1979), Keelung (基隆) (Kato, 1925c), Taipei (臺北) (Kato, 1927a), Neihu (內湖) (Kato, 1932), Jingmei (景美, 景尾) (Matsumura, 1917), Pinglin (坪林) (Kato, 1932); [HC] Hsinchu (新竹) (Kato, 1925c), Beipu (北埔) (Matsumura, 1917); [IL] Fushan (new); [KH] Jiashian (甲仙) (Schumacher, 1915); [TT] Peinan (卑南), Taitung (臺東) City (Schumacher, 1915); Dapan (大板) (Schumacher, 1915); [PT] Ligang (里港, 阿里港) (Schumacher, 1915), Hengchuen (恒春) (Matsumura, 1917), Gangkou (港口) (Schumacher, 1915).

Distribution. Taiwan, Japan, Korea, China, and Malaysia.

Taiwanese name 蟲姑 (Taiwanese names in this study are mostly from several illustrated books on the Taiwanese insects written in Chinese.); **Chinese name** 蟲姑 (Chou *et al.*, 1997).

Platyplectron takasagona Matsumura, 1917

(Fig. 5)

Platyplectron kuroiwae var. *takasagona* Matsumura, 1917: 187 [TL: Kiirun, Formosa]; Schmidt, 1932: 117.*Platyplectron kuroiwae* var. *formosana*: Kato, 1925a: 3 (error of var. *takasagona*).*Platyplectron kaempferi* var. *takasagona*: Kato, 1927a: 20.*Platyplectron kaempferi takasagona*: Kato, 1930: 51, 62.*Platyplectron takasagona*: Kato, 1931: 219; Kato, 1932: 226; Kato, 1933a, pl. 2; Kato, 1938a: 3; Kato, 1956: 109, 114, 126, 185; Hayashi, 1979: 259; Duffels and van der Laan, 1985: 27; Chou *et al.*, 1997: 172.

Diagnosis. Head and pronotum jade green with various black markings. Forewing with fuscous and ochreous broad cloudy markings at basal 1/2, on apical and cubital areas, and one near apex but much smaller than *P. kaempferi*, costal membrane with two blackish spots, remainder of forewings hyaline; hind wing black or much infuscated, outer marginal areas hyaline. Anterior margin of head more or less roundish; margin of lateral dilated part of pronotum forming a relatively obtuse angle or a roundish line at an angle of more than 120°. See also the description by Kato (1932).

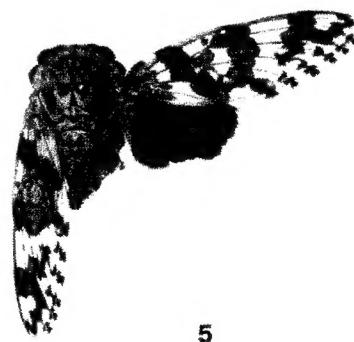
Measurements. Body length: ♂ 18–21 mm, ♀ 21–23 mm. Total length: ♂ 31–36 mm, ♀ 35–37 mm.

Material examined. [TP] 2 ♂, Yangmingshan, 17 VII 1973, M Hayashi (SUU); [IL] 1 ♂, Jentze Hot Springs (仁澤溫泉), 16 VIII 2002, YJ Lee (YJL); [ML] 4 ♂, 6 ♀, Mt. Shih-tou-shan (= Mt. Shrtoushan 獅頭山), 24 VI 1973, M Hayashi (SUU); [TC] 1 ♂, Guguan (谷關), 11 VII 2001, YJ Lee (YJL); [HL] 2 ♂, 1 ♀, Hualien (花蓮), 13 VII 2001, YJ Lee (YJL); [NT] 1 ♂, Chingching Grassland (青青草原), 12 VII 2000, CH Lai (YJL); 7 ♂, 2 ♀, Lushan (廬山), 26 VI 1973, M Hayashi (SUU); 1 ♀, Wushe (霧社), 10 VIII 1972, S Miyagi (SUU); 1 ♀, Shrtzutou (獅仔頭), 12 VIII 1996, C Lo (YJL); 1 ♀, same locality, 14 VIII 2002, C Lo (YJL); 1 ♂, Sun Moon Lake (日月潭), V 1999, CH Lai (YJL); 1 ♂, same locality, V 2000, YJ Lee (YJL); 1 ♂, 1 ♀, same locality, 6 VII 2000, CH Lai (YJL); 3 ♂, same locality, 15 VII 2000, CH Lai (YJL); [TT] 1 ♂, Liyuan (栗園), 8 VII 1996, KT Park (CIS); 1 ♂, 2 ♀, Chihpen (= Jrben 知本), 11 VII 1973, M Hayashi (SUU); [PT] 1 ♂, Souka (= Shouka 壽峯), Shihtyu (= Shrtzu 獅子), 20 VI 2002, M Hayashi (SUU); 1 ♀, Kending (= Kenting 墾丁), 15 VII 1993, YB Fan (TFRI); 2 ♂, 5 ♀, O-luan Pi (= Eluanbi 鵝巒鼻), 9 VII 1973, M Hayashi (SUU).

Biology. This species is widely distributed throughout Taiwan occurring from lowlands to montane areas up to about 2,000 m in altitude. Adults appear from April to August. They perch on the branches and trunks, often lower than 3 m high, of various trees. Males start to sing usually at about 0600h in the morning. Their chirping is hardly affected by weather



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Figs. 4–5. 4. A female *Platyplectron kaempferi* in dorsal view; 5. A male *Platyplectron takasagona* in dorsal view.

conditions and often lasts even after sunset. See also the information given by Kato (1956).

Male chirping. The chirping resembles that of *P. kaempferi*, but the duration of a cycle of the chirping is much shorter than *P. kaempferi*, so as in *P. kuroiwa* Matsumura from the Ryukyus, Japan. See also the descriptions given by Kato (1932, 1956).

Localities. [TP] Mt. Mientianshan (Hayashi, 1979), Chutzu Lake (Kato, 1932), Mt. Yangmingshan (Kato, 1931), Beitou (北投) (Kato, 1932), Keelung (Matsumura, 1917), Taipei (Kato, 1931; Hayashi, 1979), Shilin (士林) (Kato, 1932), Wulai (烏來) (Kato, 1931); [TY] Taoyuan (桃園) (Kato, 1932); [HC] Hsinchu (Kato, 1932); [IL] Jentze Hot Springs (new); [ML] Mt. Shrtoushan (new); [TC] Fengyuan (豐原) (Hayashi, 1979), Guguan (new); [HL] Tienhsiang (天祥) (Hayashi, 1979), Hualien Port (花蓮港) (Kato, 1932), Hualien (new); [NT] Chingching Grassland (new), Lushan (Hayashi, 1979), Wushe (new), Nanshanchi (南山溪) (■ (confirmed by male chirping, not by specimen)) (new), Shrtzutou (new), Puli (埔里) (Kato, 1932), Lienhuachr (蓮華池) (■ (new), Sun Moon Lake (new), Shueilikeng (水裡坑) (Kato, 1932), Neimaopu (內茅埔 = Shinyi 信義) (Kato, 1932); [CI] Juchi (竹崎) (Kato, 1932); [TT] Liyuan (new), Taitung (Hayashi, 1979), Jrben (new); [PT] Pingtung (屏東) (Kato, 1932), Shouka (new), Hengchuen (Kato, 1932), Kenting (new), Eluanbi (new).

Distribution. Taiwan.

Taiwanese name 小蟋蟀; *Chinese name* 高蟋蟀 (Chou *et al.*, 1997).

Platycleura hilpa Walker, 1850

Platycleura hilpa Walker, 1850: 6 [TL: China]; Kato, 1925a: 3; Kato, 1927a: 21; Kato, 1930: 56, 62; Kato, 1932: 228; Kato, 1933a, pl. 1; Chen, 1933: 359; Kato, 1934: 146; Kato, 1938a: 3; Kato, 1938b: 2; Kato, 1956: 126, 185; Duffels and van der Laan, 1985: 20; Chou *et al.*, 1997: 170.

Diagnosis. See the descriptions by Kato (1932) and Chou *et al.* (1997). This species can be easily distinguished from other Taiwanese congeners by the coloration on the hind wing. The hind wing of this species is yellowish with dark ochreous markings along the marginal veins and on the central part.

Material examined. No specimen was available.

Biology. According to Kato (1956), the population in the Penghu Islands (澎湖島) lives on *Pandanus edoratissimus* L. that is the only host plant in the islands and cannot fly due to the strong wind.

Locality. [PH] Penghu Islands (Kato, 1925a).

Distribution. Taiwan (Penghu Islands) and China (southern part).

Chinese name 黃蟋蟀 (Chou *et al.*, 1997).

Genus *Suishsha* Kato, 1928

Suishsha Kato, 1928b: 183. Type species: *Dasysaltria formosana* Kato, 1927 (Formosa).

Diagnosis. Small-sized; Body thickened, convex dorsally, short, broad, and covered with long hairs; eyes not prominent; head wide, anterior margin roundly produced, including eyes about as wide as or slightly wider than base of mesonotum; lateral margin of pronotum laminationately produced; tymbal covering globose laterally; tymbal concealed with tymbal covering dorsally as well as laterally; abdomen obconical, shorter than distance from head to cruciform elevation; ovipositor hardly extending beyond pygofer; fore femur with three indistinct spines on under surface; male operculum short, transverse, roundish, and overlapping each other; forewing with eight apical cells, 6th apical cell about as long as twice of 5th apical cell, costal membrane (precostal area) much expanded and veins C and Sc+R well separated basally, outer margin straight, furnished with fuscous and ochreous cloudy

markings.

This genus is probably allied to *Pycna* Amyot and Audinet-Serville, but distinguished by the head width as wide as or slightly wider than the mesonotum.

***Suishas formosana* (Kato, 1927)**

(Fig. 6)

Dasyphsaltria formosana Kato, 1927b: 210 [TL: Suisha near Jitsu-getsu-tan, Central Formosa].

Suishas formosana: Kato, 1928b: 183; Kato, 1930: 51, 62; Kato, 1932: 232; Kato, 1933a, pl. 2; Kato, 1938a: 3; Kato, 1938b: 2; Kato, 1940: 2; Kato, 1956: 126, 185, 271; Hayashi, 1978: 277; Duffels and van der Laan, 1985: 35; Chou *et al.*, 1997: 176.

Diagnosis. Male. Body covered with long hairs; head greenish with black markings and spots; pronotum greenish with a central longitudinal fasciae and markings along furrows of inner area, blackish; mesonotum dull ochreous, slightly mixed with olivaceous, with black markings; cruciform elevation dark ochreous; abdomen black with narrowly dull ochreous posterior margins at each tergum; tymbal covering grayish. Ventral part of body pale olivaceous with blackish markings; abdomen fuscous with dull ochreous posterior margins at each sternum. Forewing hyaline but opaque, ochreous, at basal 1/2 with two fuscous spots on costal membrane and radial area, and pale fuscous irregular markings on bases and apices of 1st and 2nd cubital areas and on bases of 1st, 2nd, 3rd, 4th, and 5th apical areas; hind wing opaque, mostly black or much infuscated but ochreous at apical parts of 2nd, 3rd, 4th, and 5th apical areas, except for hyaline outer marginal area. Head including eyes about as wide as base of mesonotum; abdomen distinctly shorter than distance from head to cruciform elevation. See also the descriptions by Kato (1932) and Chou *et al.* (1997).

Similar to *S. coreana*, but differing in the smaller body-size, coloration and marking pattern on the thoracic nota, coloration of the hind wing, and so on.

Male genitalia. See the figures by Hayashi (1978).

Measurements. Body length: ♂ approximately 18 mm.

Material examined. [TP] 4 ♂, Wulai, 23 III 1968, Y Arita (SUU); [IL] 2 ♂, Fushan, 30 III 1995, YC Sen (TFRI); 1 ♂, same locality, 27 IV 1995, SS Lu (TFRI); [NT] 1 ♂, Suisha (= Shueishe 水社), 15 III 1927, M Kato (KUF).

Biology. This species has been known from northern and central Taiwan. Adults appear from December to April. According to Kato (1927b, 1956), males sing on grayish brown tree trunks from about 0530h in the morning and even under the rain, and adults perch on rather low tree trunks and stay there for a long time.

Male chirping. According to Kato (1940), the song begins with feeble sound "churrrrrrrr!" often continuing for several minutes long and then changes to the main tone like "chi chi chi chi chi chii——! chi chi chi chi chi chii——!" that is rather feeble. See also the descriptions

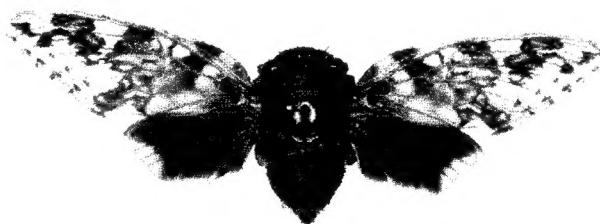


Fig. 6. A male *Suishas formosana* in dorsal view (photograph by Mr. H.Y. Wang) (Taiwan Forestry Research Institute).

given by Kato (1927b, 1932).

Localities. [TP] Wulai (new); [IL] Fushan (new); [NT] Shueishe near Sun Moon Lake (Kato, 1927b).

Distribution. Taiwan and China (Zhejiang).

Chinese name 臺灣毛蟬 (Chou *et al.*, 1997).

Tribe Tibicenini

Key to the genera of Tibicenini

1. Body lusterless, of mostly bright color or with conspicuous colorful markings; cruciform elevation not depressed, comparatively narrow; metathoracic prepisternum not elevated at center 2
- Body lustrous, mostly black with few markings; cruciform elevation depressed and comparatively wide; metathoracic prepisternum distinctly elevated at center, forming an acute-tipped process *Cryptotympana*
2. Anterior margin of head nearly even but frontoclypeus prominent anteriorly; lateral margin of pronotum relatively developed and wide *Tibicen*
- Anterior margin of head triangularly expanded anteriorly; lateral margin of pronotum insignificant *Chremistica*

Genus *Tibicen* Latreille, 1825

Tibicen Latreille, 1825: 426. Type species: *Cicada plebeja* Scopoli, 1763 (Europe).

Lyristes Horváth, 1926: 96. Type species: *Cicada plebeja* Scopoli, 1763 (Europe).

Diagnosis. Large-, sometimes medium-sized; eyes prominent laterally; head including eyes wider than base of mesonotum; frontoclypeus somewhat tumid; lateral margin of pronotum a little amplified, not dentate; tymbal completely concealed with tymbal covering; male abdomen obconical, about as long as or longer than distance from head to cruciform elevation; 8th abdominal tergum long, longer than twice of 7th tergum in median length; ovipositor not extending beyond pygofer; fore femur with two big and a very small spines on under surface; male operculum longitudinal and touching or overlapping each other, with apex broadly convex; wings hyaline; forewing with eight apical cells, 1st apical cell very slender, clearly narrower than 1/2 of width of 2nd apical cell.

Several workers recommend using the generic name *Lyristes* Horváth for this group (*cf.* Boulard, 2000) to avoid the confusion with *Tibicina*.

Key to the species of *Tibicen*

1. Frontoclypeus rather thick in front view with ratio of length to width of about 1.0; length of frontoclypeus 1.5 times as long as that of clypeus; lateral part of mesepimeron comparatively narrow and reaching to posterior margin of metanepisternum; male operculum oval and short, about as long as wide, not extending beyond 2nd abdominal sternum *chujoii*
- Frontoclypeus rather slender in front view with ratio of length to width of about 1.2; length of frontoclypeus about 1.7 times as long as that of clypeus; lateral part of mesepimeron developed and extending posteriorly beyond metanepisternum; male operculum a little pointed at apex, longer than wide, extending to middle of 4th abdominal sternum *flavomarginatus*

Tibicen chujoi Esaki, 1935

(Fig. 7)

Tibicen chujoi Esaki, 1935: 201 [TL: Arisan, Taichū-shū, Central Formosa and Taiheizan, Taihoku-shū, Northern Formosa]; Kato, 1938a: 7; Kato, 1956: 114, 128, 190, 273; Duffels and van der Laan, 1985: 67; Okada, 2002: 71.

Tibicen atrofasciatus: Okada, 2000: 18 (nec Kirkaldy, 1909).

Diagnosis. See the description by Esaki (1935) and partly by Hayashi (1977).

Male genitalia. See the description and figures by Hayashi (1977).

Measurements (Esaki, 1935). Body length: ♂ 34–37 mm. Total length: ♂ 50–52 mm. Expanse of forewings: ♂ 91–95 mm. (A specimen of *T. flavomarginatus* from Taiheizan (= Mt. Taipingshan 太平山 [IL]) was erroneously included in these measurements.)

Material examined. [CI] 1 ♂ (holotype), Arisan (= Mt. Alishan 阿里山), Central Formosa, 25 V 1934, M Chūjō (KUF).

Biology. This species seems to inhabit coniferous forests in montane areas of central Taiwan centering on Mt. Alishan [CI] (about 2,050 m alt.). According to Okada (2002), the male chirpings were heard and the exuviae were collected from a coniferous forest predominant to *Chamaecyparis obtuse* var. *formosana*. See also the information given by Kato (1956) and Okada (2000).

Male chirping. According to Okada (2002), the chirping sound is similar to that of *Tibicen bihamatus* (Motschulsky, 1861) in Japan, and the duration of a chirping is about 1–2 min.

Localities. [CI] Mt. Alishan (Esaki, 1935; Okada, 2000, 2002).

The paratype (in the collection of M. Kato) from Mt. Taipingshan [IL] must be identical with the next species as suggested by Hayashi (1977); the locality is herein deleted from the range of *T. chujoi*.

Distribution. Taiwan.

Tibicen flavomarginatus Hayashi, 1977

(Fig. 8)

Tibicen flavomarginatus Hayashi, 1977: 185 [TL: Tai-ping-shan, Ilan Province, Northern Taiwan]; Duffels and van der Laan, 1985: 70; Okada, 1999: 23.

Diagnosis. See the description by Hayashi (1977).

Male genitalia. See the description and figures by Hayashi (1977).

Measurements (Hayashi, 1977). Body length: ♂ 35.0 mm. Total length: ♂ 51.4 mm. Expanse of forewings: ♂ approximately 95 mm.

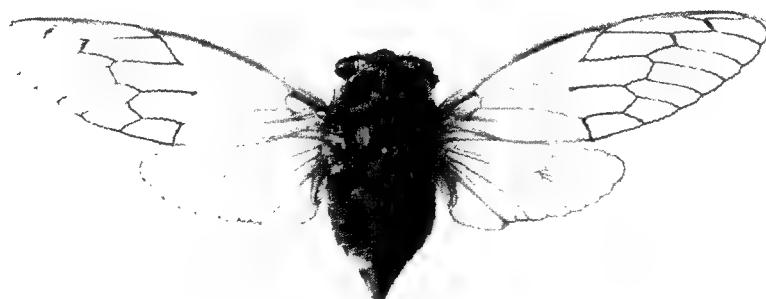


Fig. 7. A female *Tibicen chujoi* in dorsal view (photograph by Mr. M. Okada).

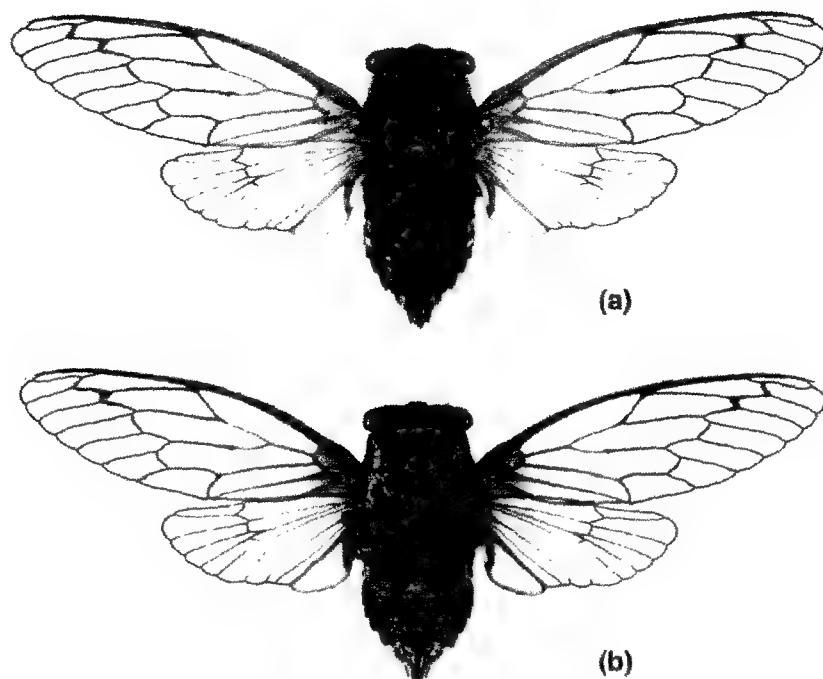


Fig. 8. A male *Tibicen flavomarginatus* in dorsal (a) and ventral (b) views.

Material examined. [IL] 1 ♂ (holotype), Tai-ping-shan, Ilan, Northern Taiwan, VII–VIII 1935, S Ueno (KUF); [TC] 1 ♀, Lishan (梨山), collecting date and collector unknown (SUU); 1 ♂, Fushoushan (福壽山) (about 2,000 m alt.), Lishan, 18 VII 1998, M Okada (SUU).

Biology. This species is distributed in montane areas of northern and central Taiwan centering on the area between Mt. Taipingshan [IL] and Lishan [TC]. Males start to sing at about 0830h. According to Okada (1999), the habitat in Lishan (about 2,000 m alt.) is an apple and pear orchard and pine forest surrounding the orchard, and males often sing on high branches, most actively in the morning. This behavior is similarly found from most of other Far Eastern Palaearctic *Tibicen* species.

Male chirping. The first author heard the voice of probably this species near Suyuan (思源) [TC] on August 16, 2002 and near Piluchi (畢祿溪) [NT] on July 13, 2001. The call was gentle and continuous sound of “ddrrrrrr—” with no fluctuation and interruption similarly to other Far Eastern Asian species of *Tibicen* including *T. intermedius* (cf. Lee, 1999). See also the very brief notes provided by Okada (1999, 2002).

Localities. [IL] Mt. Taipingshan (Hayashi, 1977); [TC] Lishan (Okada, 1999).

Distribution. Taiwan.

Genus *Chremistica* Stål, 1870

Chremistica Stål, 1870: 714. Type species: *Fidicina ochracea* Walker, 1850 (China).
Rihana Distant, 1904: 426. Type species: *Fidicina ochracea* Walker, 1850 (China).

Diagnosis. Small- or medium-sized; eyes prominent laterally; head including eyes wider than base of mesonotum; anterior margin of head forming a triangle with frontoclypeus

prominent anteriorly; lateral margin of pronotum insignificant; tymbal completely concealed with tymbal covering; male abdomen a little longer than, but female abdomen about as long as or shorter than, distance from head to cruciform elevation; 8th abdominal tergum much longer than 7th tergum in median length; ovipositor not extending beyond pygofer; fore femur with two big and a very small spines on under surface; male operculum longitudinal, overlapping each other, and not exceeding posterior margin of 3rd abdominal sternum in most cases, with apex broadly rounded; wings hyaline without infuscation.

***Chremistica ochracea* (Walker, 1850)**
(Fig. 9)

Fidicina ochracea Walker, 1850: 99 [TL: China].

Rihana ochracea: Distant, 1906: 32; Matsumura, 1913: 81; Schumacher, 1915: 109; Matsumura, 1917: 189; Kato, 1925a: 6; Kato, 1927a: 22; Kato, 1930: 51, 62; Kato, 1931: 219; Kato, 1932: 252; Kato, 1933a, pl. 4; Hirayama, 1933, pl. 95; Kato, 1934: 149; Kato, 1938a: 7.

Cicada ochracea: Matsumura, 1907: 101.

Chremistica ochracea: Chen, 1933: 359; Wu, 1935: 5; Kato, 1956: 110, 114, 128, 186; Hayashi, 1979: 260; Duffels and van der Laan, 1985: 59; Chou *et al.*, 1997: 266.

Rihana ochracea var. *takesakiana* Kato, 1927a: 22 [TL: Takesaki near Kagi, Formosa]; Kato, 1930: 62; Kato, 1932: 253; Kato, 1938a: 7; Kato, 1956: 114, 271 (*Chremistica*); Duffels and van der Laan, 1985: 59 (*Chremistica*).

Rihana ochracea var. *gracilis* Kato, 1927a: 22 [TL: Takesaki and Toroku, Formosa]; Kato, 1930: 62; Kato, 1932: 253; Kato, 1938a: 7; Kato, 1956: 114, 271 (*Chremistica*); Duffels and van der Laan, 1985: 59 (*Chremistica*).

Rihana ochracea var. *interrupta* Kato, 1927a: 22 [TL: Takesaki and Taihoku, Formosa]; Kato, 1930: 62; Kato, 1932: 253; Kato, 1933a, pl. 5; Kato, 1938a: 7; Kato, 1956: 114, 271 (*Chremistica*); Duffels and van der Laan, 1985: 59 (*Chremistica*).

Diagnosis. See the descriptions by Kato (1932) and Chou *et al.* (1997). Body ochreous or light green without significant markings except for a transverse black fascia along anterior margin of head and a black marking on margin of each ocellus; eye castaneous. Ventral part of body pale ochreous or pale green and partly covered with white pollinosity. Wings hyaline without infuscation; veins greenish basally and fuscous apically. Frontoclypeus somewhat prominent anteriorly; male opercula slightly overlapping each other posteriorly, and not extending beyond 2nd abdominal sternum.

Measurements. Body length: ♂ 25–31 mm, ♀ 21–24.5 mm. Total length: ♂ 39–45 mm,

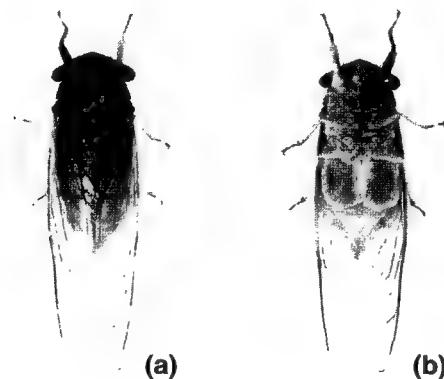


Fig. 9. A male *Chremistica ochracea* in dorsal (a) and ventral (b) views.

♀ 38–43 mm.

Material examined. [TP] 1 ♂, Tanshui, 16 VI 1973, M Hayashi (SUU); 1 ♂, Neihu, Taipei City, 6 VIII 1997, JT Chao (TFRI); 1 ♂, Taipei Botanic Garden, Taipei City, 25 VIII 1995, YB Fan (TFRI); [ML] 2 ♂, Mt. Shih-tou-shan, 24 VI 1973, M Hayashi (SUU); [NT] 1 ♂, Lienhuachih (= Lienhuachr), 1 VII 1973, M Hayashi (SUU); 1 ♂, 1 ♀, Lia-Hwa-Chi (= Lienhuachr), 690 m alt., 4 VII 1996, KT Park and HK Lee (CIS); 1 ♂, 1 ♀, Sun Moon Lake, VI 1999, CH Lai (YJL); 2 ♂, 1 ♀, same locality, 6 VII 2000, CH Lai (YJL); 1 ♂, same locality, 21 VII 2000, CH Lai (YJL); 1 ♂, 3 ♀, same locality, VII 2000, CH Lai (YJL); 2 ♀, same locality, 7 VIII 2000, CH Lai (YJL); 1 ♂, same locality, 25 VI 2002, CH Lai (YJL); 1 ♀, Chushan Shiaping, 3 VII 2001, UV light, ML Chan, NMNS ENT 3653–188 (NMNS); [PT] 5 ♂, 7 ♀, Souka, Shihtyu, 20 VI 2002, light trap, M Hayashi *et al.* (SUU); 10 ♂, 4 ♀, Kenting Park, 8–9 VII 1973, M Hayashi (SUU); 1 ♂, 1 ♀, O-luan Pi, 9 VII 1973, M Hayashi (SUU).

Biology. This species is widely distributed in Taiwan from lowlands to low montane areas. Adults appear from April to September. When a male starts to sing, other males nearby follow it to make a chorus, which suddenly finishes at once. According to Kato (1931), males often sing in the evening in the early season but are active in the daytime in June and July, and adults are attracted to electric light at night. According to Kato (1956), adults always stay on twigs and do not readily fly. See also the information for the Taiwanese population given by Kato (1933a).

Male chirping. Males produce a monotonous and continuous buzzing sound “zaaaa—” with no fluctuation. A chirping suddenly starts to last for several tens of seconds to several minutes and then suddenly stops. See also the descriptions given by Kato (1932, 1956).

Localities. [TP] Danshuei (new), Mt. Yangmingshan (Kato, 1931), Keelung (Kato, 1932), Taipei (Kato, 1927a; Hayashi, 1979), Neihu (new), Taipei Botanic Garden, Taipei City (new), Wulai (Kato, 1931; Hayashi, 1979); [TY] Taoyuan (Kato, 1932); [HC] Beipu (Kato, 1932); [ML] Mt. Shrtoushan (new); [NT] Lienhuachr (new), Sun Moon Lake (new), Chushan Shiaping (new); [YL] Douliou (斗六) (Kato, 1927a); [CI] Juchi (Kato, 1927a), Mt. Dakengshan (大坑山) (Kato, 1932), Chiai (嘉義) (Kato, 1932); [PT] Shouka (new), Heng-chuen (Kato, 1932), Gangkou (Schumacher, 1915), Kenting Park (new), Kenting (Hayashi, 1979), Eluanbi (new).

Distribution. Taiwan and China (southern part).

Taiwanese name 薄翅蟬; *Chinese name* 安蟬 (Chou *et al.*, 1997).

Genus *Cryptotympana* Stål, 1861

Cryptotympana Stål, 1861: 613. Type species: *Tettigonia pustulata* Fabricius, 1787 (China).

Diagnosis. See the description by Hayashi (1987a). Large-sized; body stout, with smooth-surfaced and glossy dorsum; eyes prominent laterally; head including eyes wider than base of mesonotum; frontoclypeus wide, approximately 1/3 the width of head; rostrum relatively short, extending to or slightly beyond mid coxae; lateral margin of pronotum moderately or slightly sinuate; cruciform elevation depressed and widened; male tymbal covering complete, entirely concealing tymbal; abdomen obconical, longer than or as long as head and thorax; ovipositor not or slightly beyond 9th tergum caudally; fore femur with two distinct spines on under surface; male operculum oblong or triangular and contiguous or slightly overlapping each other at the inner basal part; forewing with eight apical cells; costal veins of forewing stout, nearly straight before node.

Hayashi (1987a) proposed subdivision of the genus into 11 phyletic groups. The four species occurring in Taiwan are represented by three groups.

Key to the species of *Cryptotympana*

1. Male operculum short and roundish in shape, about as long as wide *atrata*
- Male operculum more or less triangular, longer than wide 2
2. Forewing mostly hyaline, with basal cell, sometimes its surrounding and basal area of cell 1A, black *takasagona*
- Forewing remarkably black on basal part and often smoky on apical part 3
3. Wings opaque and black in basal 1/2 before nodal line, while more or less smoky in the rest *holsti*
- Wings hyaline, and forewing smoky on apical part with black part on basal cell and areas along veins before nodal line *kotoshoensis*

***Cryptotympana atrata* (Fabricius, 1775)**

(Fig. 10)

Tettigonia atrata Fabricius, 1775: 681 [TL: China].

Cryptotympana atrata: Duffels and van der Laan, 1985: 80; Hayashi, 1987b: 33; Chou *et al.*, 1997: 276.

Tettigonia pustulata Fabricius, 1787: 266 [TL: China]; Matsumura, 1907: 100 (*Cryptotympana*); Schumacher, 1915: 110 (*Cryptotympana*); Matsumura, 1917: 191 (*Cryptotympana*); Kato, 1925a: 10 (*Cryptotympana*); Kato, 1927a: 23 (*Cryptotympana*); Kato, 1930: 51, 62 (*Cryptotympana*); Kato, 1931: 220 (*Cryptotympana*); Kato, 1932: 257 (*Cryptotympana*); Schmidt, 1932: 122 (*Cryptotympana*); Kato, 1933a, pls. 6, 12 (*Cryptotympana*); Chen, 1933: 359 (*Cryptotympana*); Kato, 1934: 150 (*Cryptotympana*); Wu, 1935: 9 (*Cryptotympana*); Hirayama, 1937: 184 (*Cryptotympana*); Kato, 1938a: 8 (*Cryptotympana*); Kato, 1956: 110, 115, 128, 186 (*Cryptotympana*).

Diagnosis. See the description and geographic variations shown by Hayashi (1987b). Body almost entirely black with golden pilosity; head, thorax, and abdomen lustrous black with a lateral spot along anterior margin of vertex, a central longitudinal fascia on frontoclypeus, orange; cruciform elevation sometimes including orange spots; lateral part of abdomen margined with orange. Ventral part of body black with golden pilosity; legs composed of black and orange ochreous parts; male operculum hemmed by orange very slightly (narrower than the populations of Korea and mainland China); abdomen black and very narrowly margined with orange. Wings hyaline with basal cell black, areas along cross veins without infuscation; veins reddish brown (differently from greenish ochreous in the Korean population) basally and black apically. Head including eyes about as wide as mesonotum; male operculum short and roundish in shape, about as long as wide, extending slightly beyond apical margin of 2nd abdominal segment, with inner margin overlapping, apex rounded.

Male genitalia. See the description and figures (for Chinese specimens) by Hayashi (1987b).

Measurements. Body length: ♂ 42–44 mm, ♀ 40–44 mm. Total length: 62–69 mm.

Material examined. [TP] 1♀, Taipei Botanic Garden, Taipei City, 1 VIII 1985, YQ Shen (TFRI); [NT] 1♂, Puli, 20 VI 1999, YJ Lee (YJL); [CH] 1♂, 1♀, Changhua, V 2000, CH Lai (YJL); 7♂, 5♀, Shihu (溪湖), 20 VI 2000, CH Lai (YJL); 1♀, same locality, 23 V 2002, CH Lai (YJL); [YL] 1♂, Szehu, 9 VII 1996, JJ Chan (TFRI); [TN] 14♂, 8♀, Chungshan Park (中山公園), Tainan, 19 VI 2002, M Hayashi *et al.* (SUU); 3♂, 1♀, Huweiliao (虎尾寮), Tainan, 19 VI 2002, M Hayashi (SUU). Other specimens examined (SUU) are listed by Hayashi (1987b) as the depository "MH".

Biology. This species is widely distributed in lowlands of Taiwan. Adults appear from May to September. Adults favor bright surroundings, and they often aggregate to the trees along the open countryside roads or streets. When a male starts to sing, other males nearby follow it one by one. See also the notes for the Taiwanese population given by Matsumura (1907) and Kato (1931, 1956).

Male chirping. The chirping can hardly be distinguished from that of the Korean population

(Lee, 1999). A call is a continuous, high, and harsh tone of “chrrrrrrr——” starting with a rather weak sound but immediately getting louder to reach climax and then getting weaker and fading away. A call lasts for about 20 sec. in normal conditions. Further observations were reported by Hayashi (2002) for the Taiwanese populations. See also the descriptions given by Kato (1932, 1956).

Localities. [TP] Koseki near Shrmen (石門) (Hayashi, 1987b), Keelung (Kato, 1930), Taipei (Kato, 1927a), Taipei Botanic Garden, Taipei City (new), Shulin (樹林) (Kato, 1927a), Sanchih (Hayashi, 1987b), Wulai (Kato, 1931); [TY] Taoyuan (Kato, 1927a), Pingjen (平鎮) (Kato, 1927a); [HC] Hsinchu (Kato, 1927a); [ML] Toufen (頭份) (Hayashi, 1987b), Penglai (蓬萊) (Hayashi, 1987b); [TC] Taichung (臺中) City (新竹) (new); [NT] Wushe (Hayashi, 1987b), Puli (new); [CH] Changhua (new), Shihu (new); [YL] Szehu (new); [CI] Dalin (大林) (Schumacher, 1915; Hayashi, 1987b), Chiai (Schumacher, 1915); [TN] Tainan (Schumacher, 1915), Chungshan Park, Tainan (new), Huweiliao, Tainan (new), Anping (安平) (Schumacher, 1915; Hayashi, 1987b).

Distribution. Taiwan, Japan (Honshu), Korea, China, and Indo-China (northern part).

Chinese name 蚂蟬 (黑蚱蟬) (Chou *et al.*, 1997).

Cryptotympana takasagona Kato, 1925

(Fig. 11)

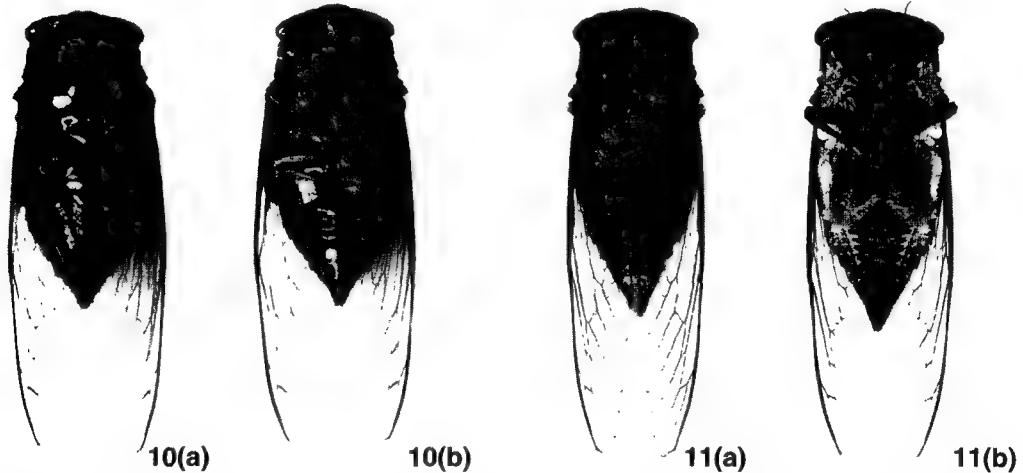
Cryptotympana intermedia: Matsumura, 1907: 100; Schumacher, 1915: 110; Matsumura, 1917: 192 (*intermedia* [sic]) (nec Signoret, 1849).

Cryptotympana facialis: Kato, 1927a: 24 (*facialis* [sic]); Kato, 1928b: 186; Kato, 1930: 51, 63; Kato, 1932: 263; Kato, 1933a, pl. 11; Chen, 1933: 359; Hirayama, 1933, pl. 94; Wu, 1935: 7; Kato, 1938a: 9; Kato, 1956: 110, 115, 129 (nec Walker, 1858).

Cryptotympana facialis var. *formosana* Kato, 1925a: 11 (*facialis* [sic] var.) [TL: Kiirun, Formosa]; Kato, 1927a: 24 (*facialis* [sic] var.); Duffels and van der Laan, 1985: 83 (nec Walker, 1858).

Cryptotympana takasagona Kato, 1925a: 12 [TL: Whole Formosa]; Kato, 1927a: 23; Kato, 1930: 51, 63; Kato, 1931: 220; Kato, 1932: 264; Kato, 1933a, pl. 7; Kato, 1938a: 9; Kato, 1956: 110, 115, 129, 186, 270; Hayashi, 1979: 260; Duffels and van der Laan, 1985: 86; Hayashi, 1987b: 57; Chou *et al.*, 1997: 280.

Cryptotympana argenteus Kato, 1925a: 13 [TL: Kashoto Island, Formosa]; Kato, 1927a: 24; Kato, 1930: 56, 63; Kato, 1932: 265; Kato, 1933a, pl. 8; Kato, 1938a: 9; Kato, 1956: 115, 129, 270; Duffels and van der



Figs. 10–11. 10. A male *Cryptotympana atrata* in dorsal (a) and ventral (b) views; 11. A male *Cryptotympana takasagona* in dorsal (a) and ventral (b) views.

Laan, 1985: 80.

Cryptotympana okinawana: Kato, 1928b: 187; Kato, 1930: 51, 63 (nec Matsumura, 1927).

Diagnosis. See the description by Hayashi (1987b). Body black and glossy with golden pilosity; head, thorax, and abdomen lustrous black with a central longitudinal ochreous fascia on frontoclypeus. Ventral part of body mostly black covered with golden pilosity; lateral marginal areas of thorax, opercula, and a part of abdomen covered with white pollinosity; legs composed of black and ochreous parts; male operculum almost entirely colored with reddish or ochreous orange or dull ochreous. Wings hyaline with basal black part slightly beyond basal cell, areas along cross veins without infuscation; veins greenish ochreous basally and black apically. Head including eyes wider than base of mesonotum; eyes comparatively large, more or less prominent laterally; male operculum triangularly oblong, longer than wide, wider at base, extending slightly beyond apical margin of 2nd abdominal segment, with inner margin straight or slightly emarginate toward the apex and overlapping.

Male genitalia. See the description and figures by Hayashi (1987b).

Measurements. Body length: ♂ 38–47 mm, ♀ 37–44 mm. Total length: 58–70 mm.

Material examined. [TC] 1 ♂, Dajia (大甲), 12 VII 2000, CH Lai (YJL); 1 ♀, Guguan, 11 VII 2001, YJ Lee (YJL); [NT] 1 ♀, Wushe, 21 VI 1999, YJ Lee (YJL); 1 ♂, same locality, 9 VII 2001, YJ Lee (YJL); 1 ♀, Shrtzutou, 12 VII 1996, C Lo (YJL); 1 ♂, 1 ♀, same locality, 12 VIII 1996, C Lo (YJL); 1 ♂, Sun Moon Lake, V 1999, CH Lai (YJL); 1 ♂, 1 ♀, same locality, 26 VI 2000, YJ Lee (YJL); 1 ♂, 1 ♀, same locality, VII 2000, CH Lai (YJL). Other material (SUU) is listed by Hayashi (1987b) as the depository "MH".

Biology. This species is one of the most abundant species in Taiwan and widely distributed throughout Taiwan occurring from lowlands to montane areas up to about 1,200 m in altitude. Adults appear from May to October. They usually stay on branches of various trees and sometimes congregate in large numbers in a certain tree. Adults favor bright surroundings. Males are most active in the sunny morning and start to sing usually at about 0830h. Both sexes are attracted to electric light at night. See also the information for the Taiwanese population given by Kato (1933a, 1956) and Hayashi (1987b).

Male chirping. The chirping sounds like "shik shik shik shik...". See also the description given by Kato (1932).

Localities. [TP] Danshuei (Hayashi, 1987b), Mt. Yangmingshan (Kato, 1927a), Beitou (Kato, 1932), Keelung (Kato, 1925a, 1927a), Taipei (Kato, 1927a), Sungshan (松山) (Hayashi, 1979), Wulai (Kato, 1927a; Hayashi, 1979); [TY] Shangpaleng (上巴陵) (♂) (new); [HC] Paoshihli, Shinpu (新埔) (Hayashi, 1987b), Hsinchu (Kato, 1927a), Beipu (Kato, 1927a), Daping (大坪) (Kato, 1927a); [ML] Toufen (Hayashi, 1987b), Mt. Shrtoushan (Hayashi, 1987b), Penglai (Hayashi, 1987b); [TC] Dajia (new), Guguan (Hayashi, 1987b), Taichung (Hayashi, 1979); [HL] Tienhsiang (Hayashi, 1979), Taroko (太魯閣) (Hayashi, 1987b), Hualien (♂) (new), Hungye Hot Springs (紅葉溫泉) (Hayashi, 1987b), Rueisuei (瑞穗) (Hayashi, 1987b); [NT] Lushan Hot Springs (廬山溫泉) (Hayashi, 1987b), Chunyang (春陽) (1,200 m alt.) near Lushan Hot Springs (Hayashi, 1987b), Wushe (new), Meichi (眉溪) (Hayashi, 1987b), Nanshanchi (Hayashi, 1987b), Shrtzutou (new), Puli (Kato, 1927a), Lienhuachr (Hayashi, 1987b), Nantou (南投) (Kato, 1927a), Sun Moon Lake (new), Jiji (集集) (Hayashi, 1987b), Penpuchi (Hayashi, 1987b), Dungpu Hot Springs (東埔溫泉) (Hayashi, 1979); [CI] Futingjin (覆鼎金) (Kato, 1932), Dalin (Schumacher, 1915; Hayashi, 1987b), Juchi (Kato, 1927a), Mt. Dakengshan (Kato, 1932), Chiai (Kato, 1927a), near 36 km point of the provincial road #18 (♂) (new); [KH] Jiashian (Schumacher, 1915; Hayashi, 1987b), Liouguei (六龜) (Hayashi, 1987b), Fa Kuo Shan (800 m alt.) near Liouguei (Hayashi, 1987b), Tsai Tie Ku near Liouguei (Hayashi, 1987b), Shanping (扇平) (♂) (new); [TN] Guantzling (關子嶺)

(Hayashi, 1987b), Tainan (Schumacher, 1915; Kato, 1927a); [TT] near 174.5 km point of the provincial road #20 near Wulu (霧鹿) (1,100 m alt.) (♂) (new), Tulan (都蘭) (Hayashi, 1987b), Taitung (Hayashi, 1987b), Pi Shan Spa (7–800 m alt.) (Hayashi, 1987b), Jrben (Hayashi, 1987b), Dapan (Hayashi, 1987b), Liudau Island (綠島) (Kato, 1925a); [PT] Ligang (Schumacher, 1915), Hengchuen (Kato, 1927a), Kenting National Park (Hayashi, 1979, 1987b), Eluanbi (Hayashi, 1987b); [UN] Taihanratsu (Kato, 1932).

Distribution. Taiwan (including Liudau Island) and China (Fujian).

Taiwanese name 熊蟬 (高砂熊蟬); *Chinese name* 橙蚱蟬 (Chou *et al.*, 1997).

Cryptotympana holsti Distant, 1904

(Fig. 12)

Cryptotympana holsti Distant, 1904b: 331 [TL: Formosa]; Distant, 1906: 46; Matsumura, 1907: 101;

Matsumura, 1913: 84; Schumacher, 1915: 110; Matsumura, 1917: 192; Kato, 1925a: 14; Kato, 1927a: 24; Kato, 1930: 51, 63; Kato, 1931: 220; Kato, 1932: 268; Schmidt, 1932: 123; Kato, 1933a, pls. 10, 19; Hirayama, 1933, pl. 94; Wu, 1935: 8; Kato, 1938a: 9; Kato, 1939: 2; Kato, 1956: 110, 115, 130, 187; Hayashi, 1979: 259; Duffels and van der Laan, 1985: 83; Hayashi, 1987b: 79; Chou *et al.*, 1997: 277.

Cryptotympana mandarina: Schumacher, 1915: 110; Kato, 1925a: 13; Kato, 1927a: 24; Kato, 1930: 51, 63; Kato, 1932: 266; Kato, 1933b, pl. 2; Chen, 1933: 359; Kato, 1934: 152; Wu, 1935: 8; Kato, 1938a: 9; Kato, 1938b: 3 (nec Distant, 1891).

Cryptotympana vitalisi Distant, 1917: 320 [TL: Indo-China].

Cryptotympana fusca Kato, 1925a: 13 [TL: Taihoku, Formosa]; Kato, 1927a: 24; Kato, 1930: 51, 63; Kato, 1932: 267; Kato, 1933a, pl. 13; Kato, 1938a: 9; Kato, 1956: 115, 129, 270; Duffels and van der Laan, 1985: 83.

Cryptotympana holsti var. *takahashii* Kato, 1925a: 14 [TL: Taihoku, Formosa]; Kato, 1927a: 24; Kato, 1930: 63; Kato, 1932: 269; Kato, 1933a, pl. 10; Kato, 1938a: 9; Kato, 1956: 115, 270; Duffels and van der Laan, 1985: 84.

Cryptotympana capillata Kato, 1925a: 15 [TL: Hori, Formosa]; Kato, 1927a: 25.

Cryptotympana holsti ab. *inornata* Matsumura, 1927: 48 [TL: Shinko and Hoppo, Formosa]; Kato, 1930: 63 (*holsti* ab. *inornata* [sic]); Kato, 1932: 270; Schmidt, 1932: 123 (*holsti* var.); Kato, 1938a: 10; Kato, 1956: 115; Duffels and van der Laan, 1985: 83.

Cryptotympana kagiana Matsumura, 1927: 49 [TL: Kagi, Formosa]; Schmidt, 1932: 122 (*kaniana* [sic]).

Cryptotympana holsti var. *capillata*: Kato, 1930: 63; Kato, 1932: 269; Kato, 1938a: 10; Kato, 1956: 115, 270; Duffels and van der Laan, 1985: 83.

Cryptotympana holsti var. *kagiana*: Kato, 1930: 63; Kato, 1932: 270 (*holsti* ab.); Kato, 1938a: 10 (*holsti* ab.); Kato, 1956: 115 (*holsti* ab.); Duffels and van der Laan, 1985: 83 (*holsti* ab.).

Diagnosis. See the description by Hayashi (1987b). Body black, lustrous, with dark castaneous or dark reddish orange markings and spots. Ventral part of body black with sparse gray or golden hairs; legs black with an obscure spot on femur dark castaneous; male operculum hemmed by dark reddish orange at outer margin; abdomen black with dark reddish orange markings and spots. Wings opaque and black in basal 1/2, while more or less smoky in the rest; black part on forewing appearing chiefly before nodal line, especially emphasized by black along veins, and the apical 1/2 infuscated in various degrees; veins almost entirely black or dark castaneous. Head including eyes slightly wider than mesonotum; male operculum triangular in shape, longer than wide, with a rather acute apex extending to middle of 3rd or sometimes to 4th abdominal segment, with outer margin oblique and scarcely sinuate, and with inner margin straight or slightly emarginate toward the apex and slightly overlapping or sometimes contiguous to the opposite toward the base.

Male genitalia. See the description and figures by Hayashi (1987b).

Measurements. Body length: ♂ 44–50 mm, ♀ 46–48 mm. Total length: 62–72 mm.

Material examined. [NT] 1 ♂, Shrtzutou, 12 VII 1996, C Lo (YJL); 1 ♂, Sun Moon Lake,

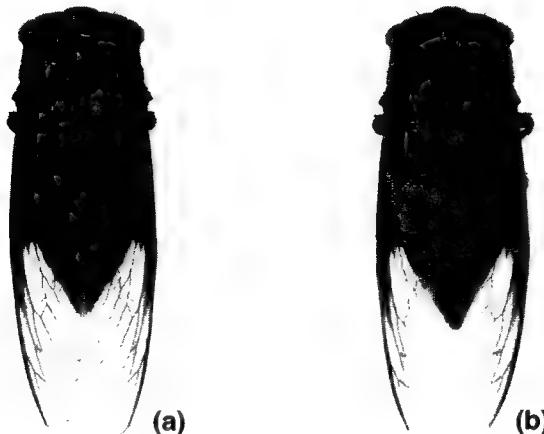


Fig. 12. A male *Cryptotympana holsti* in dorsal (a) and ventral (b) views.

11 VII 2000, CH Lai (YJL); 2♀, same locality, VII 2000, CH Lai (YJL); 1♂, same locality, 8 VII 2001, YJ Lee (YJL); [TT] 1♀, Is. Lu Tao (= Liudau Island), 8 VI 1987, K Baba (SUU). Other material (SUU) is listed by Hayashi (1987b) as the depository "MH".

Biology. This species is widely distributed in Taiwan from lowlands to montane areas up to about 1,200 m in altitude. Adults appear from May to October. Males are most active in the sunny morning and start to sing usually at about 0700h. See also the information for the Taiwanese population given by Kato (1933a, 1956) and Hayashi (1987b).

Male chirping. The chirping sounds like "meeng meeng meeng meeng...", "veeng veeng veeng veeng...", or "zeng zeng zeng zeng...". A call is concluded with the sound "vee vee vee vee...". See also the descriptions given by Kato (1932, 1956).

Localities. [TP] Mt. Mientienshan (Hayashi, 1979), Mt. Yangmingshan (Kato, 1927a), Keelung (Kato, 1927a), Taipei (Matsumura, 1907), Shindian (新店) (Hayashi, 1987b), Wulai (Kato, 1927a; Hayashi, 1979); [TY] Taoyuan (Kato, 1927a), Paleng (巴陵) (♪) (new); [HC] Hsinchu (Kato, 1927a), Beipu (Matsumura, 1927), Daping near Beipu (♪) (new); [IL] Mt. Taipingshan (Kato, 1927a); [ML] Mt. Shrtoushan (Hayashi, 1987b); [TC] Guguan (♪) (new); [HL] Tienhsiang (Hayashi, 1987b), Hualien (♪) (new), Hungye Hot Springs (Hayashi, 1987b); [NT] Wushe (1,100 m alt.) (Hayashi, 1987b), Shrtzutou (new), Beishankeng (北山坑) (Kato, 1927a), Puli (Kato, 1925a), Lienhuachr (Hayashi, 1987b), Shenkeng (深坑) (Matsumura, 1907, 1927), Wucheng (五城 = Fuhosho 茅埔庄) (Schumacher, 1915; Hayashi, 1987b), Sun Moon Lake (new); [CI] Juchi (Kato, 1927a), near 55.5 km point of the provincial road #18 near Mt. Alishan (♪) (new), Mt. Dakengshan (Kato, 1932), Chiai (Kato, 1927a; Matsumura, 1927); [KH] Jiashian (Schumacher, 1915; Hayashi, 1987b), Liouguei (Hayashi, 1987b), Shanping (♪) (new), Kaohsiung (高雄) (Kato, 1925a); [TN] Guantzling (Hayashi, 1987b), Tainan (Kato, 1927a); [TT] Jrben (Hayashi, 1987b), Gueitian (歸田) (Hayashi, 1987b), Liudau Island (new); [PT] Hengchuen (Matsumura, 1907), Kenting National Park (Hayashi, 1987b); [UN] Sokutsu (Schumacher, 1915).

Distribution. Taiwan (including Liudau Island), China (southern part), and Indo-China. A record from Lanyu Island (蘭嶼) (Matsumura, 1917) was erroneous, and the Lanyu cicada was afterward described as an independent species, *shirakii* by Matsumura (1927). The occurrence on Liudau Island is herein recorded for the first time.

Taiwanese name 臺灣熊蟬; *Chinese name* 南蚱蟬 (Chou *et al.*, 1997).

***Cryptotympana kotoshoensis* Kato, 1925**

Cryptotympana kotoshoensis Kato, 1925a: 14 [TL: Kotosho Island, Formosa]; Kato, 1927a: 25; Kato, 1930: 57, 63; Kato, 1932: 270; Kato, 1933a, pl. 9; Kato, 1938a: 10; Kato, 1956: 115, 130, 270; Duffels and van der Laan, 1985: 85; Hayashi, 1987b: 85; Chou *et al.*, 1997: 281.

Cryptotympana shirakii Matsumura, 1927: 47 [TL: Koto Isles, Formosa]; Schmidt, 1932: 123.

Diagnosis. See the description by Hayashi (1987b).

Male genitalia. See the description and figures by Hayashi (1987b).

Measurements (Hayashi, 1987b). Body length: ♂ 48–52 mm, ♀ 44–49 mm. Total length: 69–74 mm. Expanse of forewings: 132–138 mm.

Material examined. Specimens examined (SUU) are listed by Hayashi (1987b) as the depository "MH".

Locality. [TT] Lanyu Island (Kato, 1925a; Matsumura, 1927).

Distribution. Taiwan (Lanyu Island).

Chinese name 臺蚱蟬 (Chou *et al.*, 1997).

Tribe Polyneurini

On the basis of the similarity in male genitalia, etc., the genera *Polyneura*, *Angamiana*, *Formotosena*, and *Graptopsaltria* fall into the same phyletic group 'tribe Polyneurini', as indicated by Hayashi (1978).

Genus *Formotosena* Kato, 1925

Formotosena Kato, 1925b: 59. Type species: *Tosena seebohmi* Distant, 1904 (Formosa).

Diagnosis. Large-sized; body long; head including eyes about as wide as mesonotum; frontoclypeus substantially prominent anteriorly; lateral margins of pronotum sinuate, but not dentate; male tymbal covering incomplete and semicircular, tymbal partly exposed in dorsal view; male abdomen cylindrical, longer than distance from head to cruciform elevation; ovipositor hardly extending beyond pygofer; fore femur with two big and a small spines on under surface; male operculum short, transverse, roundish, and nearly touching but separated each other, with apex not reaching 3rd abdominal sternum; wings entirely opaque; forewing with eight apical cells, 6th apical cell long, longer than 2/5 of forewing length.

***Formotosena seebohmi* (Distant, 1904)**

(Fig. 13)

Tosena seebohmi Distant, 1904a: 301 [TL: Formosa]; Distant, 1906: 24; Matsumura, 1907: 94 (*seebohmi* [sic]); Matsumura, 1913: 71 (*seebohmi* [sic]); Schumacher, 1915: 108; Matsumura, 1917: 189; Kato, 1925a: 6; Schmidt, 1932: 118.

Formotosena seebohmi: Kato, 1925b: 60, 73; Kato, 1927a: 33; Kato, 1930: 53, 67; Kato, 1932: 241; Kato, 1933a, pl. 37; Hirayama, 1937: 184; Kato, 1938a: 5; Kato, 1956: 114, 127, 185; Hayashi, 1978: 273; Duffels and van der Laan, 1985: 43; Chou *et al.*, 1997: 129.

Tosena seebohmi var. *interrupta* Schumacher, 1915: 109 [TL: Chikutoge, Fuhosho, and Kosempo, Formosa]; Kato, 1925a: 6; Kato, 1925b: 73 (*Formotosena*); Kato, 1927a: 34 (*Formotosena*); Kato, 1930: 67 (*Formotosena*); Kato, 1932: 242 (*Formotosena seebohmi* ab.); Kato, 1933a, pl. 36 (*Formotosena seebohmi* ab.).

Diagnosis. Body black, lusterless; head with a triangular greenish spot at each lateral part of frontoclypeus; pronotum with light green outer dilatation, which is sometimes interrupted at central and lateral parts of posterior margin (called as var. *interrupta* or ab. *interrupta*), and a

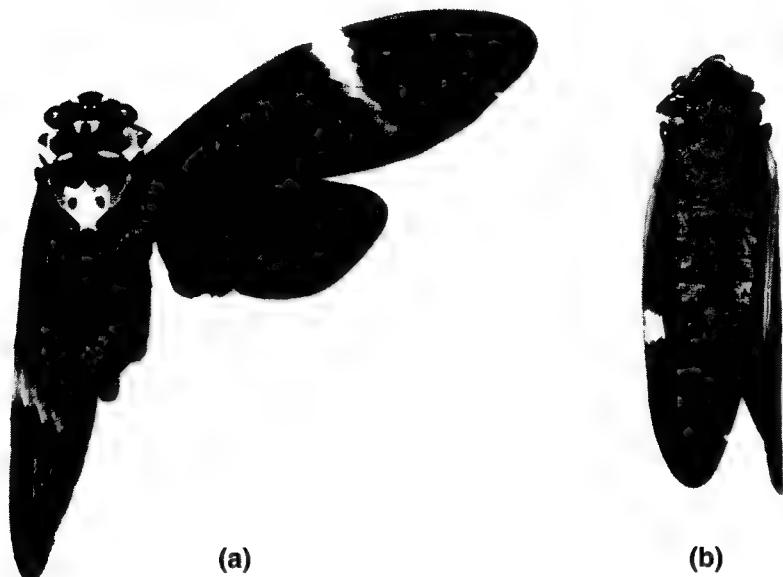


Fig. 13. A male *Formotosena seebohmi* in dorsal (a) and ventral (b) views.

pair of light green triangular spots at centro-anterior part; mesonotum with lateral margins and a large marking at centro-posterior part, which includes a pair of roundish black spots inside, greenish; cruciform elevation greenish. Ventral part of body black or dark castaneous and partly covered with white pollinosity; lateral and outer parts of frontoclypeus greenish; lateral parts of prothorax yellowish green. Wings entirely opaque and blackish castaneous (sometimes blackish along veins and smoky in the rest), with costal membrane up to nodal area greenish, other veins castaneous, a stripe across forewing from nodal area to 8th apical cell whitish, and a grayish spot inside jugum of hind wing. Body slender; frontoclypeus somewhat prominent anteriorly. See also the descriptions by Kato (1932) and Chou *et al.* (1997).

Male genitalia. See the description and figures by Hayashi (1978).

Measurements. Body length: ♂ approximately 48 mm, ♀ approximately 49 mm. Total length: ♂ approximately 75 mm, ♀ approximately 80 mm.

Material examined. [NT] 1♀, Palon, 3 VII 1986, K Baba (SUU); [KH] 12♂, 13♀, Liukuei (=Liouguei), 6 VII 1973, M Hayashi (SUU); 1♂, 1♀, Liouguei, 30 V 1999, C Lo (YJL); 2♀, Shen-Pin (=Shanping), Liukuei, II 1988, JT Chao (TFRI); [TT] 1♀, Kueitien (=Gueitian), 17 VI 1976, H Makihara (SUU).

Biology. This species is found very locally in lowlands of Taiwan. According to a resident in Liouguei [KH], the adults appear from late May to late June and most abundant in mid June. But they seem to appear also in July. According to Kato (1956), adults perch on trunks of tall trees. The second author also observed this cicada at a locality east of Liouguei in July of 1973: adults are descending on tree trunks as low as 3–5 m by 1000h (singing in males) and again begin to ascend to higher parts (trunks or branches) after 1500h.

This species has decreased in number to the endangered level in Taiwan, and even its occurrence has been much localized. For this reason, it is prohibited by the relevant laws of the Taiwanese Government to collect or export this cicada without official permissions.

Male chirping. According to Kato (1932, 1956), the chirping sounds like “meeng meeng meeng meeng...”.

Localities. [HC] Hsinchu (Matsumura, 1917); [NT] Puli (Matsumura, 1917), Wucheng (Schumacher, 1915), Palon (new); [CI] Juchi (Schumacher, 1915; Kato, 1925a), Mt. Alishan (Kato, 1925a); [KH] Jiashian (Schumacher, 1915), Liouguei (new), Shaping (new); [TT] Gueitian (new); [PT] Hengchuen (Matsumura, 1917); [UN] Torin (Matsumura, 1917).

Distribution. Taiwan and China (southern part).

Taiwanese name 臺灣爺蟬; *Chinese name* 黑麗寶島蟬 (Chou *et al.*, 1997).

Tribe **Dundubiini**

The tribe *Dundubiini* Atkinson, 1886 can be subdivided into four subtribes, *Dundubiina*, *Cosmopsaltriina*, *Cicadina*, and *Tosenina*. The tribe *Cicadini* Oshanin, 1907 has hitherto been recognized independently (Metcalf, 1963; Duffels and van der Laan, 1985), but *Dundubiini* and *Cicadina* cannot be separated from each other in tribal level. Therefore, *Cicadina* is treated in the tribe *Dundubiini* as a subtribe, *Cicadina*. Furthermore, in this subtribe, the species of the former *Terpnosiina* and *Leptopsaltriina* are also included.

Key to the subtribes of **Dundubiini**

| | |
|---|-------------------|
| 1. Male operculum well developed posteriorly, extending far beyond 3rd abdominal sternum | <i>Dundubiina</i> |
| - Male operculum small, short, and scale-like, not reaching middle of 3rd abdominal sternum | <i>Cicadina</i> |

Subtribe **Dundubiina**

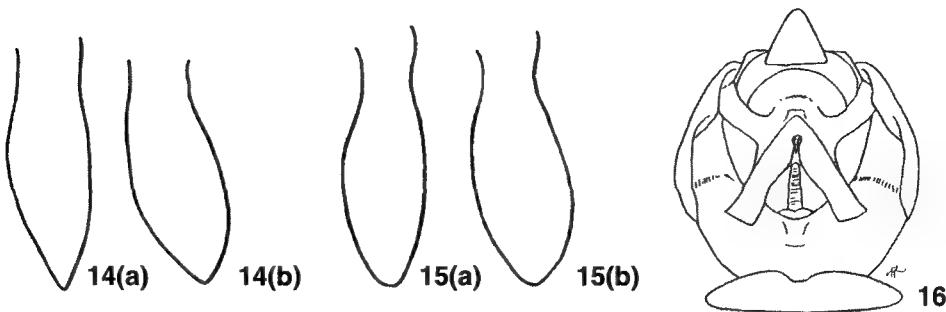
Key to the genera of **Dundubiina**

| | |
|--|-------------------|
| 1. Large-sized; ovipositor extending slightly beyond pygofer; male opercula remote each other, allowing a wide space in-between | 2 |
| - Medium-sized; ovipositor extending far beyond pygofer; male opercula touching or nearly touching each other, allowing only a narrow space in-between | <i>Meimuna</i> |
| 2. Head including eyes about as wide as or narrower than base of mesonotum; outer dilatation of pronotum much developed and broad; male operculum with narrow and comparatively acute apex; male abdomen nearly as long as distance from head to cruciform elevation | <i>Macrosemia</i> |
| - Head including eyes wider than base of mesonotum; outer dilatation of pronotum normal and not developed; male operculum with broad and roundish apex; male abdomen distinctly longer than distance from head to cruciform elevation | <i>Platylomia</i> |

Genus **Macrosemia** Kato, 1925

Macrosemia Kato, 1925b: 57. Type species: *Platylomia?* *hopponis* Kato, 1925 (Formosa).

Diagnosis. Large-sized; eyes not prominent laterally; head including eyes about as wide as base of mesonotum; frontoclypeus a little prominent anteriorly, shorter than vertex in mid-dorsal length; pronotum distinctly shorter than mesonotum excluding cruciform elevation, with outer dilatation much developed and broad, and anterolateral margin dentate; tymbal concealed with tymbal covering in dorsal view, but a little exposed laterally; male abdomen



Figs. 14–16. 14. Left male operculum of *Macrosemia kareisana* in ventral (a) and obliquely ventral (b) views; 15. Left male operculum of *Macrosemia matsumurai* in ventral (a) and obliquely ventral (b) views; 16. Ventral view of the male pygofer of *Macrosemia kareisana* (from Peitungyenshan, Wushe, Nantou).

obconical, nearly as long as or longer than distance from head to cruciform elevation; ovipositor extending a little beyond pygofer; fore femur with two big and a small spines on under surface; male operculum long with narrow apex and slightly swollen at about posterior 2/3; wings hyaline; forewing normally longer than $3.2 \times$ of its width.

Key to the species of *Macrosemia*

1. Male operculum slightly curved inwardly at anterior inner margin with acuminate tip (Fig. 14); male abdomen nearly as long as or slightly longer than distance from head to cruciform elevation; forewing slightly tinged with yellowish brown *kareisana*
- Male operculum substantially curved inwardly at anterior inner margin with rounded tip (Fig. 15); male abdomen longer than distance from head to cruciform elevation; forewing somewhat tinged with yellowish brown *matsumurai*

Macrosemia kareisana (Matsumura, 1907)

(Figs. 14, 16, 17)

Cosmopsaltria kareisana Matsumura, 1907: 98 [TL: Karēsan near Hoppo, Formosa]; Schmidt, 1932: 126. *Platylomia karēisana*: Matsumura, 1913: 74 (*karēisana* [sic]); Matsumura, 1917: 198; Kato, 1925a: 20; Kato, 1926b: 173; Kato, 1927a: 29; Schmidt, 1932: 126 (*kareisana*); Hayashi, 1979: 260 (*kareisana*); Duffels and van der Laan, 1985: 121 (*kareisana*).

Macrosemia kareisana: Kato, 1930: 52, 64; Kato, 1932: 329; Kato, 1933a, pl. 16 (*kareisana*); Hirayama, 1937: 184 (*kareisana*); Kato, 1938a: 18 (*kareisana*); Kato, 1956: 118, 137, 189 (*kareisana*); Chou *et al.*, 1997: 259 (*kareisana*); Okada, 2002: 72 (*kareisana*).

Cosmopsaltria multivocalis: Kato, 1925a: 19 (nec Matsumura, 1917).

Platylomia karapinensis Kato, 1925a: 20 [TL: Karapin, Formosa]; Kato, 1927a: 29.

Platylomia? *hopponis* Kato, 1925a: 21 [TL: Hoppo, Formosa]; Kato, 1925b: 58, 70 (*Macrosemia*); Kato, 1927a: 29 (*Macrosemia*); Kato, 1930: 52, 64 (*Macrosemia*).

Cosmopsaltria montana Kato, 1927a: 27 [TL: Arisan Forest, Mt. Niitaka, 7000–10000 ft., Formosa]; Kato, 1930: 52, 64; Kato, 1932: 325; Kato, 1933a, pl. 18; Kato, 1938a: 18; Kato, 1956: 118, 135, 189, 271 (*Orientopsaltria*); Duffels and van der Laan, 1985: 119 (*Orientopsaltria*); Duffels and Zaidi, 2000: 196 (*Platylomia*). (syn. nov.)

Macrosemia kareisana var. *karapinensis*: Kato, 1930: 64; Kato, 1932: 332; Kato, 1938a: 19 (*kareisana* var.); Kato, 1956: 118, 270 (*kareisana* var.); Duffels and van der Laan, 1985: 121 (*Platylomia kareisana* var.).

Macrosemia kareisana f. *hopponis*: Kato, 1932: 331; Kato, 1938a: 18 (*kareisana* f.); Kato, 1956: 118 (*kareisana* f.); Kato, 1956: 270 (*kareisana* var.); Duffels and van der Laan, 1985: 121 (*Platylomia kareisana* var.).

Diagnosis. Body sparsely covered with short silvery hairs; head and pronotum green or olivaceous green with black markings; head with an irregular large marking at ocellar area and several large and small irregular spots between eyes, black; pronotum with a pair of central longitudinal stripes, a very short oblique fascia at each side of them, markings along furrows of inner area (callus), and no or one irregular spot at each posterolateral part of outer dilatation, black; mesonotum black with three pairs of distinctive longitudinal green or greenish ochreous markings, of which a central pair is shortest and oblique anterolaterally, a lateral pair is sometimes fused with cruciform elevation, and an outer pair is situated along lateral margins of mesonotum, and sometimes with a pair of indistinct, irregular-shaped small markings between anterior parts of central and lateral longitudinal markings; cruciform elevation olivaceous green with blackish posterior margin; abdomen blackish with a few or sometimes no irregular greenish or ochreous markings and partly covered with silvery hairs. Ventral parts of head, thorax, and legs light green and covered with short hairs and some white pollinosity; frontoclypeus with a comparatively wide central longitudinal Y-shaped marking, a posterior transverse fascia, narrow fasciae along transverse striations, black or much infuscated; lorum mostly black; clypeus mostly black except for a central longitudinal narrow fascia, ochreous; male operculum pale olivaceous green with black apex; male abdomen mostly fuscous except for a central ochreous or greenish ochreous marking on each sternum. Forewing slightly tinged with yellowish brown; areas along 1st and 2nd cross veins always distinctly infuscated, and areas along 3rd and 4th cross veins distinctly or sometimes obscurely infuscated; a round but often indistinct infuscation present on each apical portion of veins R_3 , R_{4+5} , M_1 , M_2 , M_3 , M_4 , and CuA_1 , forming a series of spots on subapical margin. Distance between eyes comparatively wide, normally wider than $2 \times$ of diameter of eye; male abdomen nearly as long as or slightly longer than distance from head to cruciform elevation (but normally shorter than $1.1 \times$ of the distance); male operculum with acuminate tip, and anterior inner margin slightly curved inwardly (Fig. 14). See also the description by Kato (1932).

Remarks. In his original description of *Cosmopsaltria montana*, Kato (1927a) stated that the species should be independent and even should belong to a different genus from *Platylomia* (*sensu Macrosemia*) because *C. montana* has the short abdomen and was always found on mountainous regions. However, the relative length of male operculum is variable in *kareisana*, caused by the condition of specimens; the operculum becomes relatively longer if the abdomen is shortened in dry specimens. *C. montana* may have been described for an individual (specimen) of *kareisana* with the shorter abdomen. Accordingly, *Cosmopsaltria montana* is surely a junior synonym of *Macrosemia kareisana*.

Male genitalia (Fig. 16). Pygofer roundish, as long as wide, and widened at about middle in ventral view; uncus lobes bifid from base, divergent distally; aedeagus (theca) very slender, gradually narrowed toward apex.

Measurements. Body length: ♂ 37–42 mm, ♀ approximately 39 mm. Total length: ♂ 57–66 mm, ♀ approximately 60 mm.

Material examined. [ML] 1 ♂, Penglai, 20 VIII 1968, H Makihara (SUU); [TC] 3 ♀, Shuguang (勝光) (1,500 m alt.), 20 X 1999, HY Wang (NTM); 1 ♂, Wuling (武陵), 12 VIII 1991, YB Fan (TFRI); 1 ♂, Mt. Anmashan (鞍馬山) (1,900 m alt.), 21 IX 2001, CH Lai (YJL); 1 ♂, Lishan, 16 VIII 2002, YJ Lee (YJL); 4 ♂, Tachien (達見), 25 VII 1972, S Nakamura (SUU); 2 ♀, Chingshan (青山), 9–10 IX 1993, UV light, WT Yang and ML Chan (NMNS); 1 ♂, Kukuan (= Guguan), 23 X 1976, Sk Yamane (SUU); [NT] 1 ♂, Jenai (仁愛) (= Wushe) Meifeng (梅峰), 7–8 VI 1998, UV light, CS Lin and WT Yang, NMNS ENT 2948–600 (NMNS); 1 ♂, 1 ♀, Mt. Hewangshan (合望山), 9 X 1996, C Lo (YJL); 1 ♂, Chingjing Farm (清境農場), 10 IX 2002, HY Wang (NTM); 1 ♂, Hotso (= Hetzuo 合作) (Roshan) (= Lushan),

30 IX 1965, K Kaneko (SUU); 3 ♂, 1 ♀, Lushan, 21 VI 1973, M Hayashi (SUU); 5 ♂, same locality, 27 IX 1982, HY Wang (NTM); 2 ♂, same locality, 14 VIII 1983, light trap, I Kanazawa (SUU); 1 ♀, Chunyan (= Chunyang), 22–23 IX 1993, UV light, CS Lin and ML Chan (NMNS); 1 ♂, Jenai Chunyang, 12–14 VIII 1996, Mercury light, CS Lin and WT Yang (NMNS); 1 ♂, Wushe, 25 IX 1991, UV light, CS Lin (NMNS); 1 ♂, same locality, 23 X 1991, UV light, CS Lin (NMNS); 2 ♂, 1 ♀, Jenai Peitungyenshan, 23–25 IX 1998, UV light, WT Yang, NMNS ENT 2985–17, 2985–174, 2985–107 (NMNS); 1 ♀, same locality, 23–25 IX 1998, Mercury light, ML Chan and WT Yang (NMNS); 4 ♂, 1 ♀, Nanshan Chi, 3 X 1972 (SUU); 1 ♂, same locality, 26 VII 1975, S Okajima (SUU); 1 ♂, Shrtzutou, 14 VIII 2002, C Lo (YJL); 1 ♂, 1 ♀, Fenghuangku, 20–22 IX 1993, UV light, CS Lin and ML Chan (NMNS); 1 ♀, Shitou, 14 VIII 1998, KY Jiang (TFRI); [CH] 1 ♀, Changhua City, 5 IX 1998, by hand, LM Huang (NMNS); [KH] 1 ♀, Tengchih (= Tienchr 天池), 7 IX 1989, sweeping net, CC Chiang (NMNS); 1 ♂, Taoyuan Tengchih, 21–24 XI 1995, Mercury light, CS Lin and ML Chan (NMNS); 1 ♂, same locality, 20–23 VIII 1996, UV light, ML Chan and WT Yang (NMNS); 1 ♂, Tienchr, 14 VIII 2002, YJ Lee (YJL); 2 ♂, 1 ♀, Baushan (寶山), Taoyuan, date uncertain, WL Chen (YJL); 2 ♀, Liukuei, 26 VII 1975, WL Chen (SUU).

Biology. This species is widely distributed in Taiwan from low mountains to higher altitudinal zone up to about 2,500 m in altitude. Adults appear from June to November. In July and August, adults are found in high montane areas between about 1,100 m and 2,500 m in altitude. They often perch on high branches and trunks of various trees but sometimes on low places. They are not so wary. Males prefer to sing in the full sunshine but often sing under cloudy or foggy weather. They start to sing at about 0700h. They sing intermittently in the daytime and stop singing at about 1830h. Both sexes are attracted to electric light at night. See also the information given by Kato (1927a) (for *montana*), Kato (1956) (for *kareisana* and *montana*), and Okada (2002) (for *kareisana*).

Male chirping. Based on the hearings and the recordings from Lishan [TC], Piluchi [NT], Mt. Alishan [CI], and Tienchr [KH], a call begins with a sharp, metallic, and cool tone that sounds like “kee——” or “ghee——”. This tone of 2–3 sec. long is followed by fragmented tone that sounds like “kkkkkk...” or “krrrrr...” which is about 6–8 sec. long. A “kee——” tone has normally 0–2 cutting sounds inside. A “kee—— kkkkkkk...” is followed by another “kee—— kkkkkkk...”, and in this manner, “kee—— kkkkkkk...” is continuously repeated. A call lasts normally for several minutes or several tens of minutes in normal conditions. The second author observed this cicada at Lushan [NT] in June of 1973: some males continued to sing as much as 20–25 min. See also the descriptions given by Kato (1932, 1956) and Okada (2002).

Localities. [TY] Mt. Jiaupanshan (角板山) (Kato, 1926b); [HC] Hsinchu (Kato, 1926b), Beipu (as *hopponis*) (Kato, 1925a), Mt. Kelishan (可裡山) near Beipu (Matsumura, 1907); [IL] Mt. Taipingshan (Kato, 1926b); [ML] Penglai (new); [TC] Shanguang (1,500 m alt.) (new), Wuling (new), Mt. Anmashan (1,900 m alt.) (new), Lishan (new), Tachien (Hayashi, 1979), Chingshan (new), Guguan (new), Taichung (Chou *et al.*, 1997); [HL] Hualien Port (Kato, 1927a); [NT] Meifeng (new), Piluchi (¶) (new), Mt. Hewangshan (new), Chingjing Farm (new), Hetzuo, Lushan (new), Lushan (Sato, 1987), Chunyang, Wushe (new), Wushe (Kato, 1932), Peitungyenshan, Wushe (new), Nansanchi (new), Shrtzutou (new), Liying (立鷺) (Kato, 1932), Fenghuangku (new), Shitou (new), Dungpu (東埔) (2,500 m alt.) (Hayashi, 1979), Mt. Yushan (玉山, 新高山) (as *montana*) (Kato, 1927a); [CH] Changhua (new); [CI] Jiauliping (交力坪) (Kato, 1925a), Mt. Alishan (Kato, 1927a (as *montana*); Kato, 1932; Okada, 2002); [KH] Tienchr (new), Baushan, Taoyuan (new), Liouguei (new); [TT] Hsiang-yang (向陽) (2,300 m alt.) (¶) (new).

Distribution. Taiwan.

Chinese name 大馬蟬 (Chou *et al.*, 1997).

***Macrosemia matsumurai* (Kato, 1928)**

(Figs. 15, 18)

Platylomia matsumurai Kato, 1928a: 29 [TL: Mt. Kappan, Formosa].

Macrosemia matsumurai: Kato, 1930: 52, 64; Kato, 1932: 332; Kato, 1933a, pl. 17; Kato, 1938a: 19; Kato, 1956: 118, 138, 271; Duffels and van der Laan, 1985: 123; Chou *et al.*, 1997: 260.

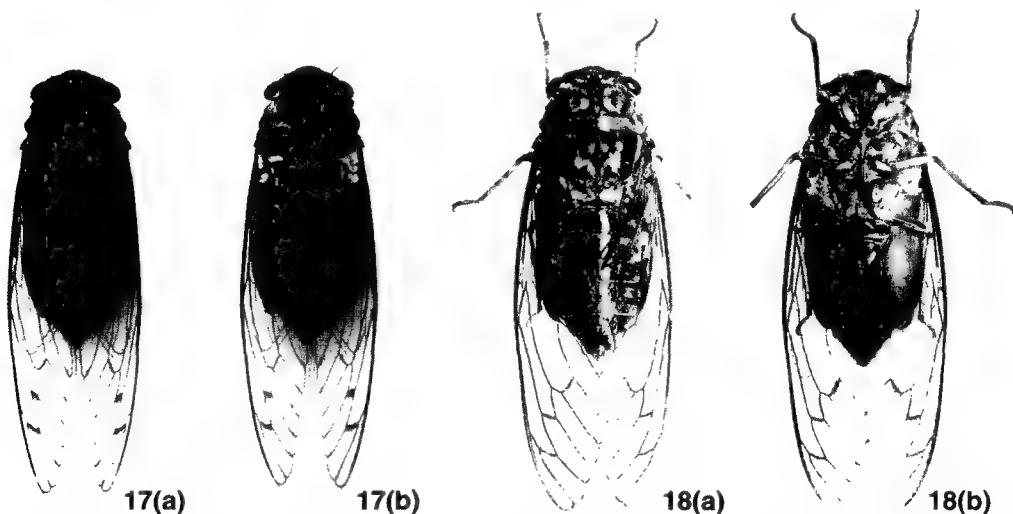
Diagnosis. Very similar to *M. kareisana*, but differing as follows: Pronotum with 1–3 irregular black spots at each posterolateral part of outer dilatation; a lateral pair of greenish longitudinal markings of mesonotum usually fused with cruciform elevation. Male operculum margined with black (sometimes very narrowly). Forewing somewhat tinged with yellowish brown; areas along 1st, 2nd, 3rd, and 4th cross veins distinctly infuscated, and sometimes base of vein M_1 infuscated. Male abdomen longer than distance from head to cruciform elevation (normally longer than $1.1 \times$ of the distance); male operculum with rounded tip, and anterior inner margin substantially curved inwardly (Fig. 15). See also the description by Kato (1932).

Male genitalia. Very similar to and hardly distinguishable from that of *M. kareisana*. As there is little difference in male genitalia between *M. kareisana* and *M. matsumurai*, it is doubtful that the latter species is independent.

Measurements. Body length: ♂ approximately 44 mm, ♀ approximately 43 mm. Total length: ♂ approximately 67 mm, ♀ approximately 67 mm.

Material examined. [TY] 1 ♂, 1 ♀, Mt. Taguanshan (達觀山 = Mt. Lalashan 拉拉山) (1,600 m alt.), 8 VIII 1991, HC Hsu (YJL); [IL] 1 ♂, Taipingshan, 29 VIII 1935, Katahira (KUF); 1 ♂, same locality, 6 VIII 1989, light trap, KW Huang (NMNS); [ML] 1 ♀, Penglai, 20 VIII 1968, H Makihara (SUU); [TT] 1 ♂, Wulu, 26 X 1984, HY Wang (NTM).

Biology. This species is locally distributed in Taiwan in montane areas above about 1,200 m in altitude. Adults appear from August. Adults often perch on high branches or trunks of various trees but sometimes on low places. They are not so wary. Males prefer to sing in the full sunshine, but often sing under cloudy weather. They start to sing at about 0750h and stop



Figs. 17–18. 17. A male *Macrosemia kareisana* in dorsal (a) and ventral (b) views; 18. A male *Macrosemia matsumurai* in dorsal (a) and ventral (b) views.

singing at about 1850h. Both sexes are attracted to electric light at night.

Male chirping. Based on the first author's hearings and recordings from Mt. Taguanshan [TY], the chirping tone is very similar to that of *M. kareisana*, which sounds like "kee—— kkkkkkk... kee—— kkkkkkk... kee—— kkkkkkk... ...". However, the duration of a "kee——" tone is about 5–8 sec., which is much longer than *kareisana*, and has 2–4 cutting sounds inside, which are repeated at a rate of one or two per 2 sec. The duration of a "kkkkkk... " sound is about 7–9 sec. similarly to *kareisana*. A call lasts normally for several minutes or several tens of minutes in normal conditions.

Localities. [TY] Mt. Jiaupanshan (Kato, 1928a), Mt. Taguanshan (1,600 m alt.) (new), Shangpaleng (new); [IL] Mt. Taipingshan (new); [ML] Penglai (new); [TT] Wulu (new).

Distribution. Taiwan and China (Hunan and Fujian).

Chinese name 松村大馬蟬 (Chou *et al.*, 1997).

Genus *Platylomia* Stål, 1870

Platylomia Stål, 1870: 708. Type species: *Tettigonia spinosa* Fabricius, 1787.

Diagnosis. Large-sized; eyes much prominent laterally; head including eyes wider than base of mesonotum; frontoclypeus substantially prominent anteriorly, longer than vertex in mid-dorsal length; pronotum distinctly shorter than mesonotum excluding cruciform elevation; outer dilatation of pronotum not developed, anterolateral margin dentate; tymbal mostly concealed with tymbal covering; male abdomen cylindrical, distinctly longer than distance from head to cruciform elevation; ovipositor extending beyond pygofer; fore femur with two big and a small spines on under surface; male operculum generally much elongated, with apex rounded or acuminated.

Platylomia bivocalis (Matsumura, 1907)

(Fig. 19)

Cosmopsaltria bivocalis Matsumura, 1907: 97 [TL: Garambi and Kankau near Koshun, Formosa].

Platylomia bivocalis: Matsumura, 1913: 72; Schumacher, 1915: 111; Matsumura, 1917: 198; Kato, 1925a: 20; Kato, 1927a: 28; Kato, 1930: 52, 64; Kato, 1932: 328; Schmidt, 1932: 126; Kato, 1933a, pls. 17–18; Kato, 1938a: 18; Kato, 1956: 118, 137; Duffels and van der Laan, 1985: 120; Chou *et al.*, 1997: 258; Beuk, 1998: 168.

Diagnosis. Body sparsely covered with short silvery hairs and some white pollinosity; head, thorax, and cruciform elevation ochreous or sometimes testaceous (olive-green in living individuals); head with a large marking at ocellar area, three pairs of small spots, and outer margins of eyes, black; pronotum with a pair of central longitudinal narrow fasciae, indistinct markings along furrows of inner area, and posterior margin of outer dilatation, blackish; mesonotum with a central longitudinal long stripe, two small spots transversely arranged at each side of posterior end of central stripe, a pair of inwardly curved stripes of 1/2 as long as central stripe, situated at the outer lateral parts anteriorly, a pair of very small longitudinal, triangular markings just outsides of anterior ends of inwardly curved stripes, and posterior margin of mesonotum, black; cruciform elevation narrowly margined with black; tymbal covering grayish ochreous; male 2nd abdominal tergum ochreous with a pair of large blackish markings, 3rd–7th terga brown with posterior marginal areas much infuscated, and 8th tergum blackish. Ventral parts of head, thorax, and legs pale ochreous (with green tinge in living specimens) with a pair of black markings on thorax; male operculum pale ochreous; abdomen dark ochreous, with marginal area of 2nd sternum infuscated. Wings hyaline and smoky, tinged with brown especially in distal part, with veins brownish; base of vein R_3 and areas



Fig. 19. A male *Platylomia bivocalis* in dorsal view (National Taiwan Museum).

along all cross veins obscurely infuscated. Male operculum extending beyond 4th abdominal sternum, calabash-shaped, with broadly rounded apex. Also refer to the descriptions by Kato (1932) and Beuk (1998).

Male genitalia. See the description and figures by Beuk (1998).

Measurements. Body length: ♂ approximately 50 mm.

Material examined. [PT] 1 ♂, 1 ♀, Changlo (長樂), 16 VI 1976, H Makihara (SUU); 1 ♂, 1 ♀, Kenting National Park, 29 VI 1997, YI Chu (NTM); 1 ♂, O-luan Pi, 8 VII 1973, M Hayashi (SUU); 2 ♂, 2 ♀, same data except for 9 VII 1973 (SUU).

Biology. This species is found only in lowlands of southernmost part of Taiwan. Adults appear from May to July. The habitat is small forests or thickets around century plant field, and cicadas prefer a leguminous tree, *Acacia confusa* Merr. (mainly) and some moraceous *Ficus* trees. See also the brief note given by Matsumura (1907).

Male chirping. See the notes given by Matsumura (1907, 1913). According to the observation by the second author at Eluanbi in 1973, its song is composed of the repetitions of "shaan, shaan, shaan ..." with a mixture of another sound "hwong, hwong, hwong ..." as a duet by two different kinds of sound. Males continue to sing for about 25 min. on lower tree trunks.

Localities. [KH] Jiashian (Schumacher, 1915); [TN] Anping (Schumacher, 1915); [PT] Changlo (new), Gangkou (Matsumura, 1907), Kenting National Park (new), Eluanbi (Matsumura, 1907).

Distribution. Taiwan.

Chinese name 二音馬蟬 (Chou et al., 1997).

Genus *Meimuna* Distant, 1905

Meimuna Distant, 1905: 67. Type species: *Dundubia tripurasura* Distant, 1885 (India).

Diagnosis. Medium-sized; male body a little slender; head including eyes wider than base of mesonotum; frontoclypeus a little or substantially prominent anteriorly, shorter or longer than vertex in median length; pronotum distinctly shorter than mesonotum excluding cruciform elevation; outer dilatation of pronotum not developed, anterolateral margin dentate; tymbal concealed with tymbal covering in dorsal view; male abdomen obconical, slightly longer than distance from head to cruciform elevation; ovipositor extending far beyond

pygofer; rostrum reaching posterior coxae; male opercula long and well separated from each other with apices rounded or acute.

Remarks. In his phylogenetic analyses based on morphological characteristics of *Dundubina*, Beuk (2002) indicates that the current *Meimuna* can be divided into two phyletic groups, and he also suggests that the typical *Meimuna* is represented by *M. tripurasura* (Distant) (type species) and its allies, and another group including Taiwanese species will be classified as an independent but undescribed genus.

Key to the species of *Meimuna*

1. Frontoclypeus convex anteriorly, as long as vertex in mid-dorsal length; male operculum short, triangular with acuminate apex, reaching near anterior margin of 4th abdominal sternum *opalifera*
- Frontoclypeus not so much prominent anteriorly, clearly shorter than vertex in mid-dorsal length; male operculum oblong, extending beyond middle of 4th abdominal sternum, and more or less developed and outwardly expanded at subapical portion 2
2. Male operculum rather flat with comparatively acute apex, and inner margin evenly but weakly curved and outer margin less sinuate *iwasakii* (*gakokizana* and *multivocalis* also)
- Male operculum outwardly expanded subapical with obtuse or rounded in distal 1/2, and inner margin evenly curved and outer margin sinuate *goshizana*

***Meimuna opalifera* (Walker, 1850)**
(Figs. 20, 21)

Dundubia opalifera Walker, 1850: 56 [TL: Corea].

Cosmopsaltria opalifera: Matsumura, 1907: 99.

Meimuna opalifera: Schumacher, 1915: 111; Matsumura, 1917: 198; Chen, 1933: 360; Hayashi, 1975a: 283; Duffels and van der Laan, 1985: 127; Chou *et al.*, 1997: 241.

Meimuna opalifera var. *formosana* Kato, 1925a: 22 [TL: Whole Formosa]; Kato, 1927a: 29; Kato, 1930: 52, 65; Kato, 1931: 220; Kato, 1932: 337; Kato, 1933a, pl. 15; Kato, 1938a: 19; Kato, 1956: 118, 188, 270; Kato, 1960: 36 (*opalifera* subsp.); Hayashi, 1975b: 419 (*opalifera* subsp.).

Meimuna longipennis Kato, 1937: 675 [TL: Naifunpo, Koshun, and Musha, Formosa]; Kato, 1938a: 19; Kato, 1938b: 10; Kato, 1956: 118, 136, 272.

Diagnosis. Head and pronotum olivaceous; head with lateral narrow fascia to a spot near base of vertex, area of ocelli, and a large irregular lateral fascia in front of eyes, black; pronotum with a central hourglass-shaped longitudinal fascia having an ‘!’-shaped olivaceous stripe inside, diagonal grooves, and two spots on posterior lateral lobe, black; mesonotum black with a pair of central short fasciae, an irregular longitudinal fascia on outer side of each longitudinal suture, lateral marginal fascia, and cruciform elevation, olivaceous; abdomen black. Ventral parts of head and thorax grayish ochreous; male operculum variable in coloration, from entirely black to entirely grayish ochreous; abdomen mostly black with semi-opaque, castaneous parts at middle. Wings hyaline; veins mostly dark ochreous or black, costal veins of forewing greenish basally; forewing with a distinct fuscous spot each on 1st and 2nd cross veins, and sometimes with a small fuscous spot each on subapical portions of veins R_3 , R_{4+5} , and M_1 , and rarely of M_2 . Head including eyes slightly wider than base of mesonotum; frontoclypeus convex anteriorly, longer than vertex in mid-dorsal length; male tymbal covering rounded; ovipositor extending beyond pygofer, as long as or slightly shorter than the segment in mid-dorsal length; male operculum triangular with pointed apex. See also the description of *M. opalifera* var. *formosana* by Kato (1932), etc.

Male genitalia. See the description and figures (for Japanese specimens) by Hayashi (1975a).

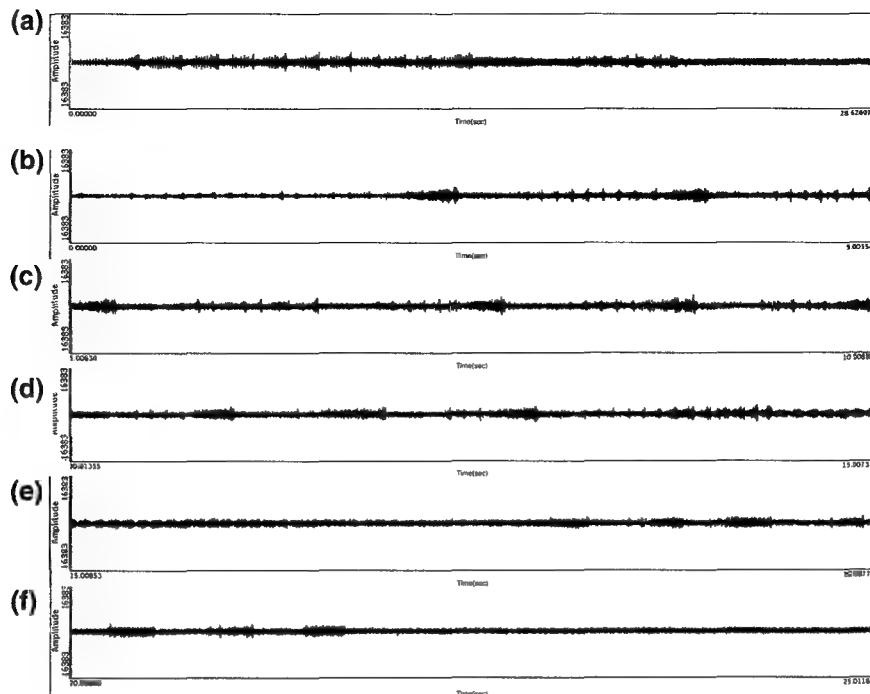


Fig. 20. Oscillogram of the male chirping of *Meimuna opalifera* for 28.6 sec. (a) and its expansion for successive 5 sec. each (b-f).

Measurements. Body length: ♂ approximately 30 mm, ♀ approximately 29 mm (approximately 26 mm excluding ovipositor). Total length: ♂ approximately 45 mm, ♀ approximately 46 mm.

Material examined. [TP] 1 ♂, Mt. Chanchushan (蟾蜍山), Taipei City, 15 XI 2000, YX Xue (TFRI); [TY] 1 ♀, Paleng, 7 VIII 1981, HY Wang (NTM); [HC] 1 ♂, Judung (竹東), date uncertain, HY Wang (NTM); [ML] 1 ♂, Shrtoushan, 13 VIII 1988, LM Juang (TFRI); [TC] 1 ♂, Sijiaolin (西角林), 10 VIII 1992, YB Fan (TFRI); [INT] 1 ♂, Jenai Chunyang, 12-14 VIII 1996, Mercury light, CS Lin and WT Yang (NMNS); 1 ♂, Shrtzutou, 17 IX 1996, C Lo (YJL); 1 ♀, Lienhuachr, 22 IX 1997, HY Wang (NTM); 1 ♀, Sun Moon Lake, 15 VII 2000, CH Lai (YJL); 1 ♂, Shueishe, 8 VII 2001, YJ Lee (YJL); [TT] 1 ♀, Wulu, 27 X 1984, HY Wang (NTM).

Biology. This species is widely spread over Taiwan from lowlands to montane areas. Adults appear from June to November but most abundant in September and October. As soon as a complete song is finished, the male often flies to a neighboring tree to begin another song there. Both sexes are attracted to electric light at night. See also the information for the Taiwanese population given by Kato (1931, 1956).

Male chirping (Fig. 20). The chirping is similar to that of the Korean population having the 'interlude' part (Lee, 1999). However, the Taiwanese population has more complicated 'second theme' part compared to the Korean or Japanese population. The second theme part sounds like "tsukutsuku sseeo—ts tsukutsuku sseeo—ts tsukutsuku sseeo—ts..." instead of simple "sseeo—ts sseeo—ts sseeo—ts..." of the Korean or Japanese population. See also the description for the Taiwanese population given by Kato (1956).

Localities. [TP] Mt. Chanchushan, Taipei City (new), Taipei (Kato, 1927a), Shindian (Kato, 1927a), Wulai (Kato, 1927a); [TY] Shangpaleng (♂) (new), Paleng (new); [HC] Hsinchu (Kato, 1927a), Judung (new), Daping near Beipu (♂) (new); [IL] Jentze Hot Springs (♂) (new); [ML] Mt. Shrtoushan (new); [TC] Guguan (♂) (new), Sijiaolin (new); [NT] Chunyang, Wushe (new), Wushe (Kato, 1937), Nanshanchi (♂) (new), Shrtzutou (new), Lienhuachr (new), Sun Moon Lake (new), Shueishe (new), Shueilikeng (Kato, 1927a), Neimaopu (Kato, 1927a, 1937); [CI] Juchi (Kato, 1927a), Mt. Dakengshan (Kato, 1927a); [KH] Jiashian (Schumacher, 1915); [TT] Wulu (new); [PT] Hengchuen (Kato, 1927a).

Distribution. Taiwan, Japan (including the Ryukyus), Korea, and China.

Taiwanese name 寒蟬; *Chinese name* 松寒蟬 (Chou *et al.*, 1997).

Meimuna iwasakii Matsumura, 1913

(Figs. 22, 23, 24)

Meimuna iwasakii Matsumura, 1913: 72 [TL: Yayeyama, Riukiu]; Hayashi, 1975a: 297; Duffels and van der Laan, 1985: 125.

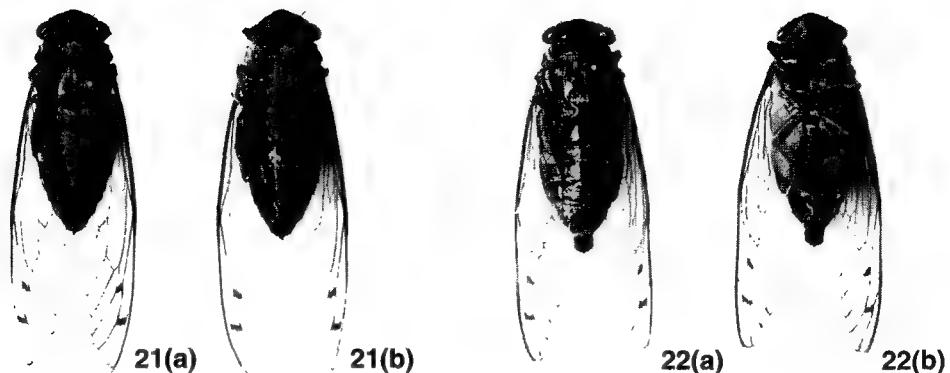
Meimuna uraina Kato, 1925a: 24 [TL: Urai, Formosa]; Kato, 1926a: 30; Kato, 1927a: 30; Kato, 1930: 52, 65; Kato, 1931: 220; Kato, 1932: 346; Kato, 1933a, pl. 15; Kato, 1956: 118, 137, 188, 270.

Meimuna uraina var. *a* Kato, 1927a: 30; Kato, 1930: 65; Kato, 1932: 347; Kato, 1956: 271.

Meimuna uraina var. *b* Kato, 1927a: 30; Kato, 1930: 65; Kato, 1932: 347; Kato, 1956: 271.

Meimuna uraina var. *c* Kato, 1927a: 30; Kato, 1930: 65; Kato, 1932: 347; Kato, 1956: 271.

Diagnosis. Head black with several irregular greenish markings at frontoclypeus and periphery of eyes and ocelli; pronotum green or olivaceous with a pair of central longitudinal stripes, gradually widened both anteriorly and posteriorly, a very short oblique fascia at each side of them, markings along furrows of inner area, 0–2 irregular spots at each posterolateral part of outer dilatation, and margins of inner area and outer dilatation, black; mesonotum black with three pairs of distinct longitudinal green or olivaceous markings, of which an anterocentral pair is shortest, a lateral pair bearing branches at each anterior ends and is usually fused with cruciform elevation and posterior ends of each anterocentral marking, and an outer pair is situated along lateral margins of mesonotum; cruciform elevation green or olivaceous with posterior margin narrowly infuscated; tymbal covering black and margined with greenish ochreous; abdomen black with greenish or ochreous markings and covered with silvery hairs; 2nd and 3rd terga each with a pair of large lateral markings (irregular in shape) and a central transverse marking on posterior margin (sometimes absent on 3rd tergum), greenish or ochreous; 4th and 5th terga sometimes with a transverse ochreous marking. Ventral parts of head, thorax, legs, and operculum greenish and covered with short silvery hairs and some white pollinosity; frontoclypeus with a central longitudinal stripe, fasciae along transverse grooves, black; lorum mostly black; clypeus mostly blackish except for a central longitudinal stripe, ochreous; legs with some irregular blackish markings; male operculum margined with blackish; male abdomen mostly fuscous sometimes with a central ochreous or greenish ochreous marking at each sternum. Wings hyaline; forewing veins reddish ochreous on basal 1/2, fuscous on apical 1/2, costal veins greenish basally; areas along 1st and 2nd cross veins infuscated, and rarely 3rd cross vein faintly infuscated; a round infuscation present on each apical portion of veins R_3 , R_{4+5} , M_1 , M_2 , M_3 , and M_4 , forming a series of spots on subapical margin. Head including eyes slightly wider than base of mesonotum; frontoclypeus moderately prominent anteriorly, shorter than vertex in mid-dorsal length; pronotum much shorter than mesonotum excluding cruciform elevation; anterolateral margin of pronotum dentate; tymbal almost entirely concealed with tymbal covering; male abdomen obconical, a little longer than distance from head to cruciform elevation; ovipositor



Figs. 21-22. 21. A male *Meimuna opalifera* in dorsal (a) and ventral (b) views; 22. A male *Meimuna iwasakii* in dorsal (a) and ventral (b) views.

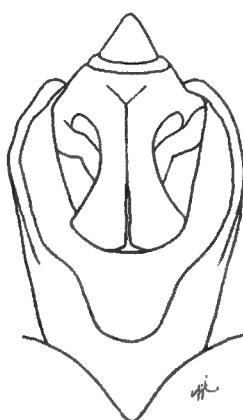


Fig. 23. Ventral view of the male pygofer of *Meimuna iwasakii* (from Wulai, Taipei).

extending far beyond pygofer; fore femur with two big and a small spines on under surface; male operculum long, acute or slightly rounded at apex, extending posteriorly to or beyond 5th sternum. See also the description of *M. uraina* by Kato (1932).

Male genitalia (Fig. 23). Pygofer long oval, subapically widened in ventral view; uncus with a pair of long, extended lobes, which are roundly curved inwardly in lateral view; aedeagus concealed by uncus lobes. See also the description and figure (for Ryukyuan specimens) by Hayashi (1975a).

Measurements. Body length: ♂ 28–32 mm, ♀ approximately 33 mm. Total length: ♂ approximately 47 mm, ♀ approximately 49 mm.

Material examined. [TP] 5 ♂, Jrshanyan (芝山巖), 31 X 2002, HY Wang (NTM); 1 ♂, Wulai, date uncertain, HY Wang (NTM); [TC] 1 ♀, Chingshan, 5 IX 1988, HY Wang (NTM); 1 ♀, same locality, 9–10 IX 1993, UV light, WT Yang and ML Chan (NMNS); 1 ♀, Chiapaotai (= Chiabautai 佳保台), 10–11 IX 1991, UV light, CS Lin (NMNS); [NT] 1 ♂, Piluchi, 16 VIII 2002, YJ Lee (YJL); 1 ♀, Lushan, 29 IX 1982, HY Wang (NTM); 1 ♀, Chunyan, 22–23 IX 1993, UV light, CS Lin and ML Chan (NMNS); 1 ♀, same locality, 20–



Fig. 24. Partial oscillogram of the male chirping of *Meimuna iwasakii* (from Piluchi, Nantou) for 5 sec.

21 X 1993, UV light, CS Lin and ML Chan (NMNS); 2 ♂, Wushe, 12–13 IX 1991, UV light, CS Lin (NMNS); 1 ♂, Shrtzutou, 17 IX 1996, C Lo (YJL).

Biology. This species is distributed in northern and central Taiwan from lowlands to high montane areas. Adults appear from August to next February. They appear earlier in high montane areas than in lowlands. Singing males are very wary, and in such condition, it is difficult to get close to them before they fly away. Males usually sing on branches of various trees. Sometimes they sing on artificial structures like utility poles similarly to *Meimuna mongolica* in Korea (Lee, 1999). Both sexes are attracted to electric light at night. See also the information for the Taiwanese population given by Kato (1931, 1956).

Male chirping (Fig. 24). A call starts with an introductory tone that sounds like “*crrrrrr*—” and suddenly changes to the main tone that sounds like “*guaeg! guaeg! guaeg! guaeg! ...*” or “*kuik! kuik! kuik! kuik! ...*”. The burst of “*guaeg!*” is repeated at a rate of about 1–3 bursts per second. Based on the hearings and recordings by the first author and Mr. H.Y. Wang (NTM), the males in Jrshanyan [TP] tends to have much slower tempo in repeating the “*guaeg!*” bursts than the males in Piluchi [NT] that tends to have much speedier tempo in repeating the bursts. The populations in the Ryukyus of Japan seem to have the intermediate tempo between the both populations of Jrshanyan and Piluchi. Between two “*guaeg!*” bursts, there is a different tone that sounds like “*crrrrrr*—” or “*chirrruk chirrruk chirrruk chirrruk ...*”, which may make someone who hears the chirping think that this species produces multiple sounds. See also the descriptions given by Kato (1932, 1956).

Localities. [TP] Jrshanyan, Taipei (Kato, 1926a), Wulai (Kato, 1925a); [TC] Chingshan (new), Chiabautai (new); [NT] Piluchi (new), Lushan (new), Chunyang (new), Wushe (new), Shrtzutou (new).

Distribution. Taiwan and Japan (the Ryukyus).

Meimuna gakkizana Matsumura, 1917

Meimuna gakkizana Matsumura, 1917: 199 [TL: Mt. Gakoki near Hoppo, Formosa]; Kato, 1925a: 24; Kato, 1927a: 30; Kato, 1930: 52, 65; Kato, 1932: 350; Schmidt, 1932: 128; Kato, 1933a, pl. 15; Kato, 1938a: 21; Kato, 1956: 118, 136; Duffels and van der Laan, 1985: 124; Chou *et al.*, 1997: 246.

Diagnosis. See the descriptions by Matsumura (1917) and Kato (1932). This species is very similar to *M. iwasakii*, but differing in the slightly smaller body-size (cf. Hayashi, 1975a), the slenderer body, etc. Male operculum rather flat with margin narrowly infuscated, extending to 6th or anterior part of 7th sternum; forewing with fuscous spots on 1st and 2nd cross veins.

Measurements. Body length: 30–31 mm. Total length: 45 mm. Expanse of forewings: 67 mm. See also the measurement by Matsumura (1917).

Material examined. Matsumura (1917) described this species on the basis of two syntypes (♂ ♀), of which only a male bearing a red type-label is preserved in the Matsumura Collection (HUS). We herein designate it as the lectotype. Lectotype ♂, [HC] “Formosa Matsumura (printed) // [underside] Hoppo 15/IX '07 (handwriting)”, “Type Matsumura (printed)”, “Type Matsumura (printed red label)”, “C. *gakkizana* n. sp. (handwriting) // det. Matsumura

(printed)", "Gakōki-zemi (Japanese names in Japanese letters, handwriting)" (HUS). Other specimens examined: [NT] 3♂, 1♀, Hotso (Roshan), 30 IX 1965, K Kaneko (SUU).

Remarks. Further study is needed to disclose whether this species is independent or only infraspecific variation of *M. iwasakii*. Furthermore, the records of *iwasakii* (*sensu uraina*) should be reconfirmed, as well.

Localities. [HC] Mt. Egongjishan (鵝公髻山) near Beipu (Matsumura, 1917); [NT] Hetzuo, Lushan (new), Wushe (Kato, 1932).

Distribution. Taiwan.

Chinese name 鵝公髻山寒蟬 (Chou *et al.*, 1997).

Meimuna goshizana Matsumura, 1917

Meimuna goshizana Matsumura, 1917: 200 [TL: Mt. Goshizan near Hoppo, Formosa]; Kato, 1925a: 24; Kato, 1927a: 30; Kato, 1930: 52, 65; Kato, 1932: 351; Schmidt, 1932: 128; Kato, 1938a: 21; Kato, 1956: 118, 136; Duffels and van der Laan, 1985: 124; Chou *et al.*, 1997: 246.

Diagnosis. See the description by Matsumura (1917) and the drawing in Kato (1932). Similar to *M. kuroiwae* Matsumura from the Ryukyus, Japan, but body smaller in size. Body slender, with a pair of central ochreous stripes on mesonotum more or less bent outward; male operculum outwardly expanded in distal portion, widely margined with fuscous, and extending to posterior margin of 6th abdominal sternum; fuscous spots of forewing appearing on 1st and 2nd cross veins and obscurely at subapices of 1st to 6th (or to 7th) longitudinal veins.

Measurements. Body length: ♂ 31 mm, ♀ 26 mm. Total length: ♂ 46 mm, ♀ 41 mm. See also the measurements by Matsumura (1917; body length 32 mm, expanse of forewings 89 mm).

Material examined. Other than a male (holotype), a female specimen is preserved in the Matsumura Collection (HUS). So far as some morphological investigations by the second author, this female well matches the male in the coloration and marking pattern. [HC] 1♂ (holotype), "Formosa Matsumura (printed) // [underside] Hoppo 21/VII '07 Goshizan (handwriting in Japanese letters)", "Cosmop. Goshizana n. sp. (handwriting) / det. Matsumura (printed)", "Type Matsumura (printed red label)", "Goshizan-tsukutsuku (Japanese another name, handwriting in Japanese letters)" (HUS); 1♀, "Formosa Matsumura (printed) // [underside] Hoppo 6/X '07 (handwriting)" (HUS).

Remarks. This species is similar to *M. kuroiwae* rather than to *M. iwasakii* or *M. gakokizana*. In Jrshanyan [TP] and Wulai [TP], both *iwasakii* and *goshizana* were recorded. The first author had a chance to hear the recordings (60 min. long) made by Mr. H.Y. Wang (NTM) in Jrshanyan on October 6, 2002. However, there were voices of only two species, *M. iwasakii* and *M. opalifera*, in the recordings. *M. goshizana* may not live in Jrshanyan.

Localities. [TP] Jrshanyan (Kato, 1938a), Wulai (Kato, 1938a); [HC] Mt. Wutzushan (五指山) near Beipu (Matsumura, 1917).

Distribution. Taiwan.

Chinese name 臺灣山寒蟬 (Chou *et al.*, 1997).

Meimuna multivocalis (Matsumura, 1917)

Cosmopsaltria multivocalis Matsumura, 1917: 197 [TL: Hoppo, Formosa]; Kato, 1927a: 27; Kato, 1930: 52, 64; Schmidt, 1932: 126; Kato, 1938a: 18.

Meimuna multivocalis: Kato, 1932: 353; Chou *et al.*, 1997: 246; Duffels and Zaidi, 2000: 196.

Orientopsaltria multivocalis: Kato, 1956: 118, 135; Duffels and van der Laan, 1985: 120.

Diagnosis. See the description by Matsumura (1917). Very similar to *M. gakokizana* as well as *M. iwasakii*, but much smaller.

Measurements. Body length 26 mm, expanse of forewings 81 mm (Matsumura, 1917). Total length: 44 mm (measured by the second author).

Material examined. Only a male (holotype) is stored in the Matsumura Collection (HUS). [HC] 1 ♂ (holotype), "Formosa Matsumura (printed), Hoppo (handwriting in Japanese letters) // [underside] 9/20 (handwriting)", "Type Matsumura (printed red label)", "C. multivocalis n. sp. (handwriting) / det. Matsumura (printed)" (HUS).

Male chirping. According to Matsumura (1917), this species produces three or four different sounds.

Remarks. As a result of the morphological examination, this species cannot be discriminated from *M. gakokizana* or *M. iwasakii*; it is very probable that the holotype male is a teneral individual of another species, *gakokizana* or *iwasakii*. Anyway, further taxonomic studies are needed on the basis of sufficient material, to elucidate its identity.

Locality. [HC] Beipu (Matsumura, 1917).

Distribution. Taiwan.

Chinese name 多音寒蟬 (Chou *et al.*, 1997).

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